

the last two years. If the argument of this book has validity, some of these judgments require modification.

Among the several points of difference between the majority of the nations on the A.E.C. and Soviet Russia, the question of whether the veto should operate in relation to matters concerning atomic energy was probably decisive in producing the final deadlock. Mr. Baruch, in putting forward the official American proposals in June, 1946, placed great emphasis on the necessity of revising the Charter of the United Nations so as to free the infliction of punishment for violation of an atomic energy agreement from the limitation imposed by the unanimity rule. The Soviet Union energetically opposed any such alteration.

In April 1948 the deadlock on the A.E.C. became so clear that the discussions were effectively brought to an end, thus terminating for the time being the attempt to obtain international control of atomic energy. It is of the highest interest to note that, shortly afterwards, Mr. Marshall, United States Secretary of State, told¹ the House of Representatives Foreign Affairs Committee that he was opposed to any scheme for amending the Charter. He was in favour of abolition of the veto in the pacific settlement of disputes, but the veto was necessary where acts of aggression were concerned. He is reported to have added: 'We do not want our man-power and our strength committed by a two-thirds vote.'

No full explanation of this remarkable change in American policy, which involves abandoning one of the essential features of the Baruch plan, has been given, but the fact that it has occurred gives hope for the future. For when negotiations for the control of atomic energy are re-started, this difficulty at least should be out of the way.

¹ *Manchester Guardian*, 6 May 1948.

CHAPTER II

AIR POWER IN THE EUROPEAN WAR (1939-45)

Ever since the first world war, acute controversy has raged over the effect of air power on warfare. As a result, the strategic bombing offensive by the Anglo-American air forces in the second world war has been the subject of particularly detailed study. Much use will be made in this chapter of the admirable analyses carried out by the United States Strategic Bombing Survey. Details of these reports and some statistical results derived from these are given in Appendix I.

In the 1920's and 1930's the controversy centred mainly on whether air power should be used primarily (a) to operate *tactically*, in support of, and in close relation with, the operations of land forces, or (b) to operate *strategically*, far into enemy territory against targets such as factories, military installations, etc., independently of the progress of other military operations. A widely held belief during this period was that the increased aerodynamic performance of bombing aircraft, combined with improved navigational methods, more accurate bomb-sights and strong defensive armament would give the bomber such a marked ascendancy over the defences, as to make possible the destruction at long range of specific military and industrial targets far into an enemy country, on such a scale as drastically to weaken the enemy's will to resist. Enthusiasts even maintained that a great nation could be induced to surrender by the exercise of air power alone.

As will be shown in detail later, the practice of attempting to defeat an enemy by deliberately destroying his cities arose out of this strategic conception of the use of air power, when the experience of actual war conditions had shown that it was not possible to hit specific small targets. What came to be called 'area' attacks, 'terror' attacks or, more often and less correctly, simply 'strategic bombing' came into being as a technically debased form of the original conception of long-range attacks on specific military and industrial targets. We will now consider the actual policies of the Eng Powers, both as judged by their preparations for the war and by their actual practice during the war.

There is ample evidence that the German Air Force was designed primarily to fill a tactical role, and in particular for close co-opera-

tion with land forces, though during the course of the war it was actually for a time used for area attacks unrelated to any land battle. The actual history of the war shows clearly that the decisive successes achieved by the German Air Force resulted from its tactical use, while its use for area attacks was a failure. The G.A.F. provided invaluable assistance to the German armies in their triumphant advances over most of the continent of Europe, by the support it gave to the land battle¹ with dive bombers (mainly Ju. 87) and by attacks, farther behind the lines, on military establishments, transport, etc., with longer-range aircraft (mainly He. III and Ju. 88). It thus came about that, except for the destruction of parts of Warsaw, Rotterdam and Belgrade, by air operations close ahead of their troops, the German advance over Europe took place without indiscriminate attacks on cities.² So, when the German occupation forces took over Poland, France, Belgium, Holland, Norway and Greece, they found relatively undamaged cities and relatively unimpaired industrial systems.

That the main role of the G.A.F. at the time of the Battle of Britain was to attack specific military and industrial targets is clearly seen from Hitler's operational orders issued on 1 August 1940, for the invasion of England.³ The emphasis on not unnecessar-

¹ 'It is quite clear from all the evidence that Hitler and the German Staff thought essentially in terms of land warfare. They failed to understand air power even more completely than they failed as regards sea power.' Tedder, *Air Power in War*, p. 45.

² 'The threat of destruction by aircraft of a city about to be attacked by the army was a normal part of Hitler's technique, and when the threat failed to induce capitulation the destruction was carried out. The timing of such a threat in relation to the advance of the land forces is shown by the case of Prague in 1938, where we have available an account of Hitler's interview with the Czech Premier Hacha on 14 March. He was told from the very outset that there was no question of negotiating, that he had to accept decisions already formed, and sign a document of surrender which had been prepared beforehand, that Prague would be occupied the next morning (German motorized detachments had already in fact crossed the Czech border . . .); and that if the least resistance was offered, the most terrible destruction would be wrought in Prague by the Luftwaffe (a forecast of Warsaw, Rotterdam and Belgrade). Hacha fainted and was given injections.' Namier, *Diplomatic Prelude*, p. 68.

There is no doubt that Hitler, by such threats, made the world think that the strategic destruction of cities was an integral part of the German techniques of war. This made it comparatively easy later on for a British Government and the R.A.F. to sell to the public the idea this was the correct strategy to adopt.

³ 'For prosecuting air and sea war against England, I have decided to carry on and intensify air and naval warfare against England in order to bring about her final defeat. For this purpose I am issuing the following orders:

'1. The German Air Force with all available forces will destroy the English Air Force as soon as possible. The attacks will be directed against airborne aircraft, then ground and supply organizations and then against industry, including the manufacture of aircraft equipment.

'2. After gaining temporary or local air superiority, air attack will be continued on harbours, paying special attention to food storage depots in London.

ily destroying the British ports which Hitler hoped to use is worth noting, as is also the stated intention to reserve terror attacks to be used only as reprisals. The heavy area attacks on British cities which started early in September, were announced as reprisals for British air attacks against German cities. A full history of these events, by which to judge finally the legitimacy of this claim, is not available, but it will be shown later that the available evidence does, on the whole, support it. The heavy area attacks on English cities and especially on London were much more destructive than the contemporary British attacks on German cities, but brought no decisive gains to Germany, and they were stopped in May 1941 owing to the preparations for the invasion of Russia.

Confirmation of the view that the G.A.F. was not designed for strategic area bombing is found in Air-Marshal Sir Arthur Harris's book, *Bomber Offensive*. In his account (p. 86) of the Battle of Britain he writes as follows:

They had in fact no strategic bombers at all, since their whole force of over a thousand bombers was designed for army co-operation work and was only used for attack on cities when not required to support the German army. Even in daytime it was fitted only to carry out the work of a tactical air force, not strategic attack.

During the war with Russia, area attacks on Moscow and other major cities appear to have been attempted at the outset. They failed to achieve any decisive success and seem to have been abandoned after a few months in favour of operations in close support of the land fighting.

Hitler did not embark again on heavy indiscriminate attacks on cities until the spring of 1944, with the introduction of the new V1 and V2 weapons. Since there was at that time only a partial defence against the V1, and none against V2, these attacks only ceased with the capture of the launching sites by the Anglo-American invasion of France. Though technically successful, they had little effect on the progress of the war as a whole. Hitler, however, probably con-

'In view of our own intended operations, attacks on harbours on the south coast must be kept down to a minimum.

'3. Attacks on warships and on merchant shipping will be of secondary importance to those against enemy air power, except when specially favourable targets present themselves. . . .

'4. The intensified air war will be so planned that adequate forces may be diverted at any time to opportunity targets. Moreover fighting strength must be maintained at disposal for operation Seelöwe.

'5. I am reserving terror attacks as reprisals.

'6. Intensification of air war to begin on August 5th, 1940. . . . Shulman, *Defeat in the West*, p. 47. London, 1947.

sidered them potentially decisive weapons, which could lead to the defeat of England.

The balance of evidence certainly justifies the conclusion that Germany neither originally planned, nor ever seriously attempted to execute, at any rate till very late in the war, a policy of attempting to defeat her enemies by air power alone.¹

The Russian view of Air Power seems to have approximated closely to the German, in the sense that it was envisaged mainly as a very important adjunct to military operations; the Soviet Air Force was designed accordingly. Few long-range bombers were either made or used,² but large numbers of fighter and fighter bombers were employed in support of the Army. The decision to concentrate on large numbers of small fighter and ground attack types, rather than on smaller numbers of long-range bombers, was probably one of the important factors which enabled her in the end to repel the German armies and eventually to drive them back. The Russian policy throughout the war, like the original German policy, did not include deliberate large scale area attacks on the residential areas of cities far behind the lines. Many of the cities occupied by the Russians in their final advance westward were certainly destroyed, some in actual fighting, many more by systematic German demolition, but few by Russian bombers.

In the Soviet-Finnish War of 1939 to 1940, large Russian air forces were employed against only weak air opposition—a situation in which decisive area attacks on cities would have been very easy to carry out. That they were not carried out is indicated by the official Finnish figures³ of the total number of civilians killed by air raids during the thirteen weeks of the war. The number was 646. As the Anglo-American forces found in their air offensive against

¹ A detailed analysis of the German theory and practice of air warfare is given by Liddell Hart, *The Revolution in Warfare*, London, 1946, and by Asher Lee in *The German Air Force*, London, 1949.

An account of the German Air Force by a German air officer, Generalleutnant H. J. Rieckhoff, has recently been published under the title *Trumpsf Oder Bluff?* (Interavia), Geneva. A detailed discussion of air strategy and tactics is given which includes an appraisal of the validity of Douhet's theory of victory by the strategic use of air power. Rieckhoff sums up the German air staff view (p. 104) in the statement that Douhet's theory was applicable against states such as France, Poland, Czecho-slovakia and England, but that it was considered as quite out of court against Russia. '... dass aber gegenüber Russland von einem strategischen Einsatz der Luftwaffe keine Rede sein konnte.' This view amounts to stating that the use of air power strategically can be decisive against a relatively weak Power but not against a major Power.

² 'None of us ever learned very much about Russian bombers. Apparently Soviet factories concentrated on the production of fighters, attack planes, medium bombers and observation ships. Heavy bombers were seldom seen, and a Russian raid on Berlin or the Ploesti oil fields of Rumania was rarely reported.' Walter Kerr, *The Russian Army*, p. 138. New York, 1944.

³ Coates, *The Soviet-Finnish Campaign*, p. 100. London, 1941.

transport and military targets in France in 1944, it is impossible to avoid killing a considerable number of civilians in this type of operation. But the very small numbers killed in the Finnish war shows that the Soviet air forces did not systematically make area attacks on civilian populations. An American journalist,¹ writing in the *New York Herald Tribune*, said: 'In so far as the war in the air is concerned, it is true that the Red Air Force never tried to exterminate the civilian population in Finland.'

The only detailed analysis of Russian air strategy available to the writer is an apparently well-informed book written in Swedish in 1944 by Sven Hermann Kjellberg and published in Zürich under the title *Russland im Krieg*. Kjellberg believes that the Soviet military authorities made a rather abrupt change of policy about 1936, involving the abandoning of long-range bombers in favour of short-range bombers and fighters mainly designed for co-operating with the Army. He believes that, prior to 1936, Russia possessed some 2,000 efficient long-range bombers, which, according to his estimate, was more than all other European Powers, including Germany, put together (p. 226). Kjellberg suggests (p. 229) that this change may have been the result of the re-armament of Germany and her consequent re-emergence as a major military Power. The interpretation that one must put on this change of policy, is that the Soviet Command considered strategic bombing effective against a weak Power but not against a strong Power. At the opening of the Russian-German war in 1941, it is clear that Russia made use of few long-range bombers,² but of very large numbers of fighters and of heavily armed and armoured attack planes (Stormoviks). Probably 50 per cent of all Russian planes were at that time of this latter type (p. 237). Kjellberg considers that, when the tide finally turned in Russia's favour after Stalingrad, it was to a considerable extent the use of aircraft of these types which made possible the subsequent almost unbroken Russian military advances. It is clear that very large numbers of light bombers and fighter aircraft were available.

Essentially the same view of Russian air strategy is held by General Martel, head of the British Military Mission in Moscow from 1941 to 1943. In his book, *The Russian Outlook*, he says of the Russian Air Force: 'By far the most important part of the Air Force is the Army Co-operation Command. In fact, this contained the greater part of the Russian Air Force. There was also a long-range bomber command for use against targets which were beyond the operational zone of the Army. . . . It was never very large and was

¹ Quoted by Coates, p. 102.

² The only heavy area attack by the Soviet air force mentioned by Kjellberg is that on Tallinn in September 1944, shortly before its capture by the Red Army.

often used to assist the Army Co-operation Command on targets in the fighting zone.' With the Russian experience in view, General Martel expressed the following opinion:

It can be argued with much reason, however, that we would have won the European war more quickly and efficiently if we had put rather more weight on co-operation between the Army and the Air Force from the start, instead of depending so much on the power of air bombardment alone.

Of the major contestants in the war, it seems to have been the British who first planned and put into operation a campaign of strategic bombing with the intention of attempting to achieve a decisive result by the use of air power alone. That this was not an improvised policy to meet a war emergency, but a long-range policy decided many years before is clear from published material. For instance, Liddell Hart, writing of the period after the war of 1914-18, says:¹

The Royal Air Force propounded the view that the bomber would be the decisive factor in any future war, and would suffice in itself to produce a decision—by destroying the industrial resources of the opposing Power. That view came to be associated with the writings of the Italian, General Douhet, but had long been a primary article in the R.A.F. creed before Douhet's theory had gained currency.

A useful analysis of some of the more extreme views of the air power enthusiasts, in particular Brigadier-General Groves and Major Seversky, is to be found in a recent book by Admiral Dickens.²

So it came about that, at the outbreak of the war in 1939, the British bombing force, small and weak as it was at the start, had been designed and trained for the purpose of strategic bombing and not for tactical co-operation with the army. In the early summer of 1940, when an attempt was made to use this force strategically against Germany, it was found to be almost completely ineffective. The aircraft available, mainly Blenheims, Hampdens and Wellingtons, were too vulnerable to fighters and anti-aircraft fire to attempt day raids,³ and their navigation, target identification and bomb aiming were too inefficient at night to hit specific military or industrial targets. 'Night photographs taken during June and July of

¹ *Revolution in Warfare*, p. 15.

² *Bombing and Total War*, London, 1946.

³ 'It had been thought that, though the bomber could not by its very nature be as fast as the fighter, yet it could cope with the fighter provided it had sufficient speed and effective defensive armament. The heavy casualties suffered by the raids off Kiel and Wilhelmshaven (1939), showed that this was not the case and from that time on till late in the war the great bulk of our bomber operations over Germany were at night.' Lord Tedder, *Air Power in War*, p. 34. London, 1948.

1941, show that of those aircraft reported to have attacked their targets in Germany only one in four got within five miles of it, and, when the target was the Ruhr, only one in ten. The proportion of total sorties, including those aircraft not reported as having attacked the target, was of course much lower' (Harris, op. cit. p. 81).

At what date the first official decision was taken to embark on a large-scale bombing offensive against German cities with the explicit object of de-housing the working population and of destroying their morale is not quite clear. Air-Marshal Harris (op. cit., p. 73) states that it had been made before he became Commander-in-Chief, Bomber Command, in February 1942.

The German defences were so strong that it was impossible to operate regularly or with sizeable force by day, so that all our main operations were confined to the hours of darkness. But at night the bomber crews were hardly ever able to find their targets even though, before I took command, it had already been decided (it was a decision with which I had nothing to do) that all our main attacks should be against large industrial areas, which meant of course, large industrial cities as a whole.

Returning to the earlier period of the war, we note that the first attack by British bombers on a German town appears to have been on Hanover in May 1940. At that time the official *communiqués* described such raids as against military targets; but the figures already quoted for the accuracy, or rather inaccuracy, of the bombing over a year later, make it certain that the bombing in these early raids must have appeared to the Germans as completely indiscriminate. Hitler, after several warnings, replied by initiating the 'Blitz' attack on London on 7 September.

Liddell Hart writes of these events:²

The German's departure from this code (i.e. of avoiding attacks on civilian populations independent of military operations) can hardly be dated before September 1940, when the night bombing of London was launched, following six successive attacks on Berlin during the previous fortnight. The Germans were strictly justified in describing this as a reprisal, especially as they had, prior to our sixth attack on Berlin, announced that they would take such action if we did not stop our night bombing of Berlin. Moreover, it must be admitted that, notwithstanding

¹ Lord Tedder writes of this decision: 'When early in 1942, Bomber Command was given the directive specifying the principal industrial cities of the Ruhr as first priority targets, the operations to be "focused on the morale of the enemy civil population and in particular on the industrial workers", this was clearly a common denominator target system—the enemy war industries were to be attacked by demoralizing the workers,' p. 98.

² *Revolution in Warfare*, p. 72.

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their overwhelming bombing superiority, they took the initiative a few weeks later in proposing a mutual agreement that would put a stop to such city bombing. Moreover, several times they discontinued their attacks when there was a pause in the much lighter British raids, thereby showing their desire for a truce to the inter-city bombing competition. The significance of these tendencies lies in their evidence, not as to German 'humanism', but as to their long term realism.

This 'realism' had clearly both a military and a political aspect. City bombing was clearly thought by Hitler in 1940 to be inefficient militarily, but also to be undesirable politically as a weapon against England; for he still hoped that England would capitulate and even join his planned war against Russia. Hitler's mass extermination of some seven million Jews and Eastern Europeans in the death camps at Maidanek, Oswiecim, Belsen, etc., and the deliberate destruction of hundreds of towns and villages in Russia showed that his reluctance to embark on area bombing of cities in 1940 was in no way derived from any reluctance to kill civilians or to destroy cities, but rather from carefully weighed considerations of political and military expediency based on the actual circumstances of the time.

It is interesting to note that J. M. Spaight, late Principal Assistant Secretary at the Air Ministry, in his book, *Bombing Vindicated*, published in 1944, also concludes that the German air attacks on British cities, starting in September 1940, were in fact a reprisal for our attacks on German cities in May, and that his own belief was that they would not otherwise have been undertaken.

It is further worth recalling that Spaight, who must, from his former official position, be held to have written as unofficial spokesman of a strong body of Service opinion, claimed the credit to Britain for introducing as a main strategic policy the area attacks on cities. 'It has been the British way of using air power which has revolutionized war.'

It is interesting to compare the scale and results of the British and German bombing offensives from August 1940 to May 1941.¹ During this period British bombers dropped some 20,000 tons of bombs on Germany; that is, at the rate of about 2,000 tons per month. In the light of information now available, the effect on German production was so small as to be quite unmeasurable; it was certainly less than 1 per cent. The number of civilians killed was less than 3,000; that is, less than 0.15 persons killed per ton of bombs dispatched. The number killed each month was about 300.

The German reply to these attacks started in September 1940,

¹ See Table 2, Appendix I.

and continued until May 1941. In these nine months 50,000 tons of bombs were dropped on Great Britain killing 40,000 civilians. That is, 0.8 people were killed for every ton of bombs dropped, or five times as many as in our offensive against Germany. The monthly weight of bombs dropped on England was 6,000, or three times that of our offensive. The monthly casualties in the U.K. by the German attacks were about 4,500 killed, which was about fifteen times the German casualties produced by the British attacks.

Thus, looking at the first period of the war as that ending in June 1941, with the start of the German attack on Russia, we see that the British attacks on cities had an almost negligible effect on the German war effort and was replied to by a German attack about three times as heavy in weight and over ten times as heavy when measured in casualties and probably also in industrial damage.

With the benefit of wisdom after the event, the same criticism can be levelled against the inception of the British bombing offensive, in 1940, as can be levelled against so much of our early war strategy. Such weak opening moves as the mining of Norwegian waters in the spring of 1940, and the move into Greece,¹ appeared to have had some psychological value at the time in satisfying the desire for some offensive action, but they were militarily so unsound that their actual effect was to precipitate a much heavier and effective counterblow by the enemy, which we were ill-prepared to meet.

Underlying the staging of the British bombing offensive in 1940-1 and the enthusiastic expectations it aroused, was a gross underestimate of the weight of bombs required to have a decisive effect on the economy and morale of a determined nation; since the estimate turned out to be wrong by a factor of at least fifty, it constitutes one of the greatest numerical blunders of military history.

Though 1942 saw some increase in the scale of the British bombing offensive, it was not till the early months of 1943 that it reached the weight of the German attack on England in 1940. This increase was due to the coming into service of a considerable number of new four-engined heavy night bombers (Lancasters, Halifaxes and Stirlings) and the American day bombers (Fortresses). From then to the end of the war, the weight of attack on Germany increased rapidly to an average rate of 100,000 tons a month in 1944 and 1945; that is, fifty times that of our initial offensive in 1940 and 1941.

¹ 'An astonishing and ironic revelation regarding the campaign in Greece has been made since the war by the Greek Commander-in-Chief, General Papagos. The Greeks actually asked Britain not to send help, feeling that it would be too small to be effective but enough to attract the Germans like a magnet. Britain insisted in order not to lose face. The whole episode now appears a sorry tale of political strategic frivolity, and the British Government did not deserve to get off as lightly as was the case.' Falls, *The Second World War*, p. 91. London, 1948.

But -
distinct
from
attack
RAF!

By the spring of 1942, the British War Cabinet had planned an all-out bombing offensive against German cities with the object of destroying a large fraction of the German working-class population, in the hope that this, and the consequent effect on civilian morale, would so reduce production as to cause a collapse of the enemy war effort.

Some aspects of the complex origin of this first modern example of a planned campaign of mass destruction as a method of winning a major war have already been discussed. Of primary importance was the low ebb of the Allied military positions, with a large part of European Russia overrun, with Rommel near Egypt, and the formidable nature of the problem of getting a foothold again in Europe. A bombing campaign seemed the only offensive action open to the Western Allies. It was inaugurated, not with careful calculation of its probable effectiveness, but as a result of a failure to find a satisfactory answer to the question 'What else can we do?' The choice of cities, rather than industrial and military targets, was dictated, as in 1940, by the inability of our night bombers to hit anything smaller. Only in the last eighteen months of the war was the technique of night bombing so improved, largely by radio aids and target marking devices, as to make possible the precision bombing of point targets.

The American report writes as follows of the objects of this campaign:¹

With the appointment early in 1942 of Sir Arthur Harris as Chief of the Bomber Command, the picture changed; for he regarded area bombing not as a temporary expedient, but as the most promising method of aerial attack. Harris and his staff had a low opinion of economic intelligence and were sceptical of 'target systems'. They had a strong belief in Germany's powers of industrial recuperation and doubted that her war potential could be significantly lowered by bombing. At the same time, they had a strong faith in the morale effects of bombing and thought that Germany's will to fight could be destroyed by the destruction of German cities. Under Harris's forceful leadership, the great area offensive was launched in the summer of 1942, to continue through subsequent years until April 1944. The first thousand-bomber raids on Cologne and Essen marked the real beginning of this campaign. Before and up to the second quarter of 1944 the great bulk of R.A.F. tonnage (60 per cent of the total dropped in 1942 and 1943) was concentrated on area raids.

The analyses of the results of the bombing offensive which are quoted in Appendix I show that Harris was correct in assuming that Germany's power of industrial recuperation was likely to be great

¹ U.S.S.B.S. 3, p. 2.

but was wrong in supposing that her will to fight would be broken by the destruction of her cities.

The American bombing policy was rather different, since their aircraft were designed as day bombers and so were strongly armed for defence. The intention was to attack 'point' targets, such as aircraft factories and oil installations. Area attacks on cities were, in general, undertaken only when weather conditions prevented the finding and bombing of 'point' targets. In the first phase of the offensive, up to the Schweinfurt raid in October 1943, the Fortresses went mainly unescorted and in close formation, relying on the defensive power of their guns. When losses due to enemy fighters got too serious, long-range fighters (Lightnings and Mustangs) were used as escorts. In the last phase of the war, when the German Air Force had almost ceased to exist, Fortresses again could safely fly unescorted. From early 1944 to the end of the war, a major part of the American effort and a very considerable part of the British effort were directed to transportation targets, railways, marshalling yards, locomotive repair facilities, etc.

An important advantage of the American day operations over the British night ones lay in the far greater toll they took of enemy fighters and so the far greater contribution they made to the winning of air superiority over the German territory.

The combined Anglo-American bombing offensive—with the British night bombers attacking mainly industrial and built-up areas, and the American day bombers attacking, where possible, factories, industrial installations, etc.—was formally adopted at the Casablanca Conference in January 1943, as a major part of the Allied war strategy. This conference authorized an enlarged scale of air attack on Germany with its objective 'the destruction and dislocation of the German military, industrial, and economic system and the undermining of the morale of the German people to the point where their capacity for armed resistance is fatally weakened.'¹ A public expression of this policy was given by Winston Churchill: 'Opinion is divided as to whether the use of air power could by itself bring about collapse in Germany and Italy. The experiment is well worth trying, so long as other methods are not excluded.'

The results of this bombing offensive, as analysed by the American Strategic Bombing Survey, are summarized in Appendix I. The remarkable and unexpected result was the discovery that German total war production continued to increase till the summer of 1944 in spite of the very heavy bombing. Figure 1 shows the actual production of German war industry (Curve 1), together with what, it is estimated, it would have been in the absence of the area bombing of cities (Curve 2). In addition, the six-monthly total of bombs

¹ U.S.S.B.S. I, p. 3.

dropped is shown in Curve 3. The rapid fall of production (*Figure 2*) which started in August 1944 (when the Anglo-American armies were already in Paris, and the Russian armies had freed the whole of their homeland and were well into Poland) was due not to the destruction of factories or the demoralization of the civilian population, but mainly to the success of the air attack on the German transport system, which impeded the flow of coal, food, etc., and to the shortage of oil.

Certain industries which were singled out for special attack were markedly affected rather earlier. Synthetic rubber and aviation spirit started to decline rapidly after March 1944. On the other hand, aircraft production continued to rise until mid-1944 (*Figure 3*).

It will be noticed that more aircraft were produced by the United Kingdom than by Germany in every year of the war till 1944, when for the first time the German production was the larger, in spite of the bombing. Part of the rapid increase of German production in the last years of the war was due to increasing concentration on single-engined fighter types, whereas a large part of British production was of four-engined bombers: the total structure weight of British aircraft production remained greater¹ than the German even in 1944. The five-fold increase of German tank production between 1941 and 1944 is even more startling (Table 5, App. I). However the causes of Germany's defeat are assessed, it was certainly not due to the direct effect of bombing on her general armament programme.

Towards the end of the war, when Allied air forces had complete superiority, the destruction of specific targets became again quite easy, but not in every case, militarily useful. When worthwhile targets for the huge Allied bomber forces became scarce, the habit of destruction had apparently become so ingrained as to lead to such attacks as that by American Fortresses on the great Skoda works outside Prague—Czechoslovakia's greatest industrial asset—on 25 April 1945. About one-third of this hitherto almost undamaged arms and engineering works was destroyed in a single raid, at a time when the American land forces were approaching from the West, and the Soviet armies from the East. Five days later,

¹ 'During the last quarter of 1944 German monthly fighter production was very considerably higher than the combined British and American fighter production.' Tedder, p. 42.

The reason why the operational strength of the G.A.F. steadily fell was due to the destruction of aircraft on the ground and when landing and taking off and to the shortage of oil. The bomber offensive was effective in reducing the strength of the G.A.F. when it was directed against airfields, oil installations, transport, but apparently ineffective when directed against aeroplane and engine factories.

Figure 1

GERMAN ARMAMENT PRODUCTION AND WEIGHT OF BOMBS DROPPED ON GERMANY

Six months average

1. Annual German production (1940 equals 100)
2. Estimated production in absence of Area Bombing
3. Total tonnage of Bombs on all targets

Production

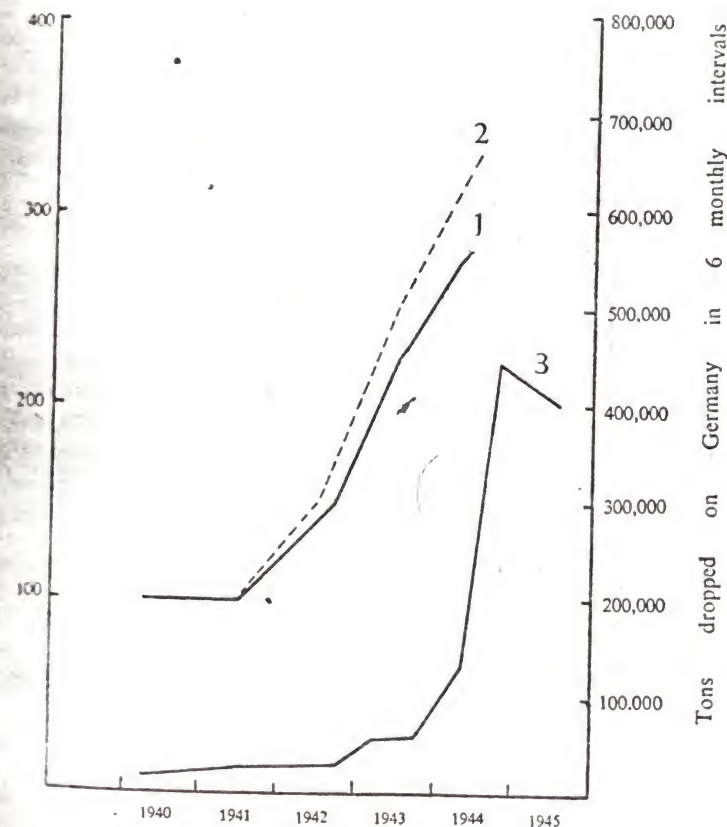


Figure 2

GERMAN ARMAMENT PRODUCTION

Three months average (1940 equals 100)

Kaldor

Production

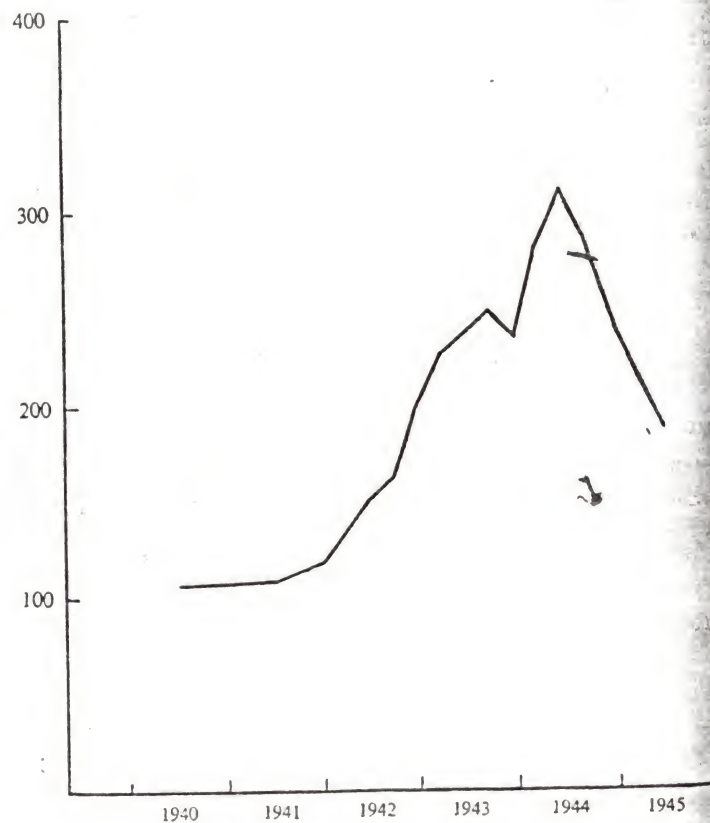
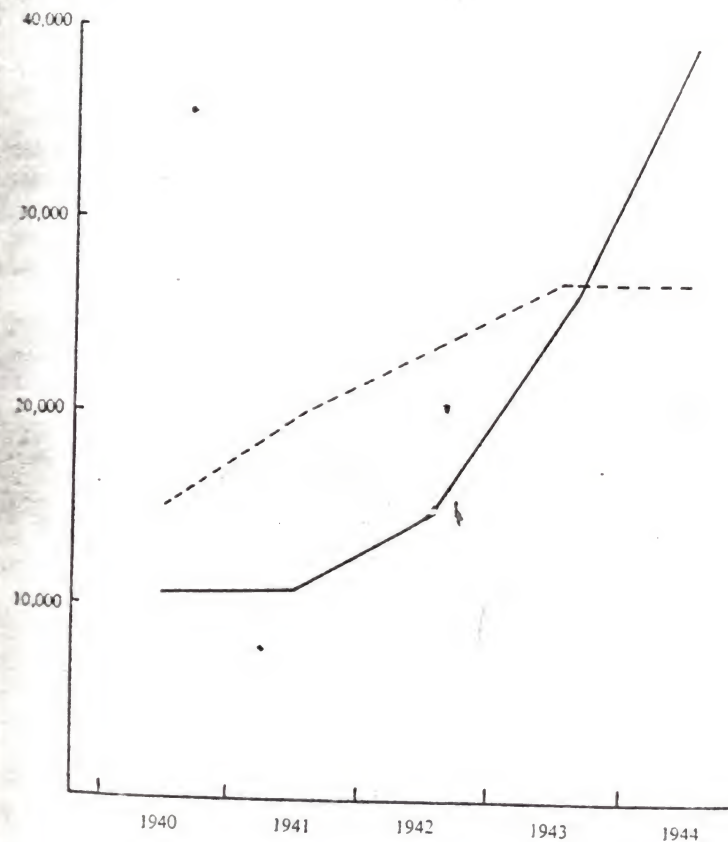


Figure 3

ANNUAL PRODUCTION OF AIRCRAFT: ALL TYPES

German ——— British - - - - -

No. of Aircraft



Hitler committed suicide in his Bunker in Berlin. On 9 May, Prague was captured almost unscathed. This act of wanton destruction considerably hindered the subsequent reconstruction of Czechoslovakia. The two explanations most current in Prague are that the attack was made either to destroy an industrial competitor, or to prevent these great works falling into the hands of the Soviet Union!

Of particular interest for the purpose of estimating the future of weapons of mass destruction are the estimates given by the American Bombing Survey (reproduced in Table 7, of Appendix I) of the loss of production due to the area bombing of German cities. The report comments as follows:

These figures demonstrate that German cities had a surprising resilience and extraordinary ability to recover from the effects of ruinous attacks. The raids on Hamburg in July-August 1943 were among the most devastating of the war. Yet, despite the deaths of over 60,000 people, the total destruction of one-third of all houses in the city and the disruption of normal processes of living, Hamburg as an economic unit was not destroyed. It never fully recovered from the bombing, but in five months it had regained 80 per cent of the former productivity, despite the fact that great areas of the city lay, and still lie, in dust and rubble. As in the case of industrial plants, when it was found much easier to destroy the buildings than the machines in them, so also it is much easier to destroy the physical structure of a city than to wipe out its economic life (*U.S.S.B.S.* 1, p. 72).

The reasons for the very surprising resilience of German industry under the Anglo-American bombing offensive are of great interest and have been analysed in detail, for instance, by Kaldor.¹ One of the contributing causes was the fact that the German economy, in spite of the huge commitment of the war on the Eastern Front, was not till quite a late date working at full capacity. Single shifts were almost universal, women were not mobilized, and arms output in general was limited by demand, not by production capacity. As a consequence, there was much slack in the economy which could be and actually was, taken up to compensate for the effects of the bombing. So convinced was Hitler in the autumn of 1941, during the battle for Moscow, that the war was effectively won, that large cancellations of armament orders were made. Germany never, in fact, waged total war.

A major success of the bombing offensive was the precision attack in 1944-5 on transportation targets and specific industrial targets such as oil installations. The American and British contributions

¹ Kaldor, *Review of Economic Studies* 1945-46, p. 33.

these operations were about 75 per cent and 25 per cent respectively. In addition, there were some cases when heavy bombers were successfully used in a tactical role. Amongst these were the bombing of the coast defence batteries shortly before the Normandy landing, and the saturation bombing of a small area at St. Lo which preceded the American break out of the Normandy beach-head. The mass attack on German cities (which was the main British contribution, both in planning and execution), though technically a success in the final stages, must be considered a strategic failure in that it affected German production remarkably little. Over 80 per cent of the area attacks were by British night bombers.

During 1943 and 1944 a very marked increase took place in the fraction of night bombers which found their target and in the accuracy of the actual bombing. This was due to a number of causes, which included the use of new radio and radar navigational aids, improved bomb sights, better training and the development of ingenious methods of target marking by flares dropped by a specially trained 'Pathfinder' force. These developments have been described in detail, for instance, in Air-Marshal Harris's book on the bombing offensive, as well as in various official publications. An important factor was the liberation of France in the summer of 1944, which made available forward air fields from which Allied fighters could operate much closer to the centres of German industry, and which allowed the setting up of forward radio-navigational stations able to guide our bombers accurately farther into Germany. As a result of these developments, much of the night bombing in the latter half of 1944 and in 1945 attained a high precision, allowing successful attacks on small targets. The American Bombing Survey sums this phase up as follows:

Not until the war in the air had been won, and the landings in the Mediterranean and France successfully accomplished, were the heavy bombers free to exploit the victory in the air and attack in full force the centres of oil production, the centres of transport and other sustaining sources of military strength within the heart of Germany. . . . The greatest single achievement of the air attack on Germany was the defeat of the German Air Forces. (*Ibid.*, p. 10)

The air offensive against oil production played a most important part in the winning of air superiority by the decisive limitation it set to German air operations. Though aircraft were in good supply, the petrol to fly them was not.

It is important to remember that the air superiority, as measured by operational strength, of all the Allies over Germany in 1944-5, when this air offensive took place, was very great. On the Western

Front, Germany had 2,473 fighters and 209 bombers, compared to the Anglo-American strength of 4,573 fighters and 2,682 bombers, of which the majority were four engined.¹

The oil and transport offensives achieved very important military results without inflicting much general destruction; the area bombing of cities gave very small militarily useful results and inflicted enormous general destruction on Germany. The former offensive demanded precision attacks; and, as has clearly been shown, these became only possible at a late stage of the war when the Allies possessed a large degree of air superiority and had advanced bases near the German frontier, to enable radar navigational methods to be more effectively employed and fighter escorts to extend their range farther into enemy country. On the other hand, the area bombing, which was originally adopted just because of the inability to do precision bombing, did little to help win the war and greatly increased our difficulties afterwards.

The night bombing offensive of the R.A.F. was an attempt to exercise air power decisively without defeating the enemy air force and without winning air superiority over enemy territory first. This attempt failed. The later successes of the bombing offensive were made possible by the gradual winning of air superiority over Germany, and this was achieved in large measure by the destruction of enemy fighters in the American day raids. It would be almost true to say that in 1943, when the bombing offensive began in earnest the success of a raid should have been estimated more by the number of enemy fighters shot down than by the amount of industrial damage produced.

It is clear that the effect of a strategic bombing campaign is dependent on the degree to which the economy of the attacked country is already strained by the demands of a major war effort on land. The effect of the Anglo-American air offensive would have been still less if Germany had not been heavily committed to a vast military campaign on the Eastern Front from June 1941 and on the Western Front from June 1944.

In spite of the great developments of air power, it is clear that Germany's defeat in the second world war, as in the first, was brought about primarily by her huge losses in man-power and material incurred in the land battles, particularly on the Eastern Front. A clear indication of this is seen from the figures of the German casualties up to November 1944 in the various theatres of war, as shown in Table 1 of Appendix II.

Of the three million killed and missing, about 75 per cent were lost in the war with Russia; that is, up to this date three times as many

¹ Tedder, p. 42.

men were lost on the Eastern Front as in all other theatres of the war. These figures confirm the view expressed by Shulman¹ in his analysis of the cause of Germany's defeat, as seen from captured documents and interrogation of the German generals. 'The furnace in which the defeat of German armies was forged was the vast Russian theatre. There, two-thirds of the total German armed strength was constantly engaged and systematically destroyed.'

Contrary to what is often said, it is thus clear that the strategic bombing offensive contributed very little direct help to the Soviet campaigns until the spring of 1944. Appreciable indirect help, however, resulted earlier from the diversion of German fighter squadrons from the Eastern Front to the defence of the Reich. Air Marshal Harris writes: 'The strategic consequence of bombing Germany may be summed up in a few simple figures: in 1941, when the Germans invaded Russia, the German army had the support of well over 50 per cent of the whole German Air Force. At the end of 1943, the German army had the support of less than 20 per cent of the whole German Air Force.'

Air power played, of course, a decisively important role in all the great land battles of the war. This was as true of the Soviet advance Westwards as of the Anglo-American advance Eastwards. Both the decisive fronts—the Russian front after June 1941 and the Western Front after June 1944—were the scene of intimate co-operation of air and land forces. The brilliant Anglo-American campaign which liberated France, and then drove on into the heart of Germany, was enormously facilitated by the almost complete command of the air enjoyed by the Allies, and the air support to the land forces provided by large numbers of fighters and fighter bombers. In addition, the attack on transportation targets in 1944 and 1945 with over 700,000 tons of bombs was a decisive success by producing a progressive interruption of the whole German transport system.

In the light of the knowledge we now have of the enormous weight of bombing required to produce an important effect on the war economy of a major power, it is possible to make some estimate of what might have happened had Germany or the Soviet Union adopted the policy of diverting a large part of their aircraft production and air effort to long-range strategic bombing. It is clear that, up to the time when France capitulated, such a change of policy on the part of Germany would have been detrimental to the German campaigns. On the one hand, such a diversion would have been at the expense of the brilliantly effective co-operation between the German Army and Air Force; and, on the other, it would have led to no compensating advantage, as the campaigns in Poland, France,

¹ *Defeat in the West.*

the Netherlands, and Norway were far too quickly won for strategic bombing to be necessary or even useful.

Very similar considerations apply to the Soviet air policy. The diversion of an appreciable fraction of the U.S.S.R.'s total air effort to strategic bombing would have led to extremely small returns in comparison with the consequent reduction in the strength of her combat and close support types, which played a vital role in all the major land battles, and which in the last two years of the war gave her air superiority on the Eastern front.

It is generally agreed that Hitler's first step towards ultimate defeat was his failure to invade England in 1940. This was mainly due to his inability to defeat the R.A.F. fighters, and so to gain air supremacy over the southern coast of England. This failure to achieve air supremacy was due to lack of sufficient fighters, both for direct offensive combat with Fighter Command, and also to escort his bombers in their attacks on air fields, etc. If Hitler had built more long-range bombers and fewer fighters, he would have been still less able to invade England in 1940. Wing-Commander Lee writes: 'Had the Luftwaffe been twice as big in 1940, as well it might have been, if it had concentrated after 1937 on the production of Messerschmidt 109's and Junker 87's, at the expense of the heavier Junker 52's and Heinkel III's, then it might have been the major instrument of successful invasion of the British Isles.'

In the light of what we have learnt from this analysis, let us turn back to British air strategy before 1939. We know that the Battle of Britain was won by only a small margin, owing to the shortage of fighters. The skill and gallantry of our fighter pilots and the technical brilliance of our fighter aircraft and of our radar stations just succeeded in saving us from the results of having deliberately diverted so much of our limited air resources to preparations for an ill-conceived and ill-planned campaign of offensive action. While the decisive battle was being fought in the air over southern England during the memorable August and September days of 1940, our long-range strategic bombing force was carrying out attacks on Germany, which were as provocative as they were ineffective, and which were soon to bring far heavier retaliation—measured in killed or in industrial and civic damage—than that which we were inflicting on Germany. Almost the only militarily useful action carried out at this time by our heavy bombers was the attack on Hitler's invasion fleet; however, this could have been more successfully done by aircraft of shorter range and higher performance.

CHAPTER III

AIR POWER IN THE PACIFIC WAR

A DETAILED account of the part played by the Air Arm in the Pacific War is given in the *United States Strategic Bombing Survey*.¹ The Japanese forces achieved their rapid advances over the Philippines, Burma, Malaya and Indonesia by the co-ordinated action of relatively small forces of highly trained naval, military and air units.

Allied air power in the Philippines, Malaya and the Dutch East Indies was virtually eliminated, mostly on the ground, in a matter of days. Those enormous areas, once local Allied air power had been eliminated, were laid open to occupation in a matter of weeks, at a total cost of less than 15,000 Japanese soldiers killed, and with the loss from all causes of 381 Japanese planes (*U.S.S.B.S.* 4, p. 1).

In such a rapid and victorious advance there was neither need for, nor was there the time in which to carry out, a strategic bombing offensive. Manila, Rangoon, Singapore all fell relatively undamaged into Japanese hands. What bombing of cities there was, as at Rangoon, was done close ahead of the attacking troops. Japan had no need to destroy the cities which she knew she could capture intact. Even if this had not been the case, it is probable that she would not have destroyed these cities even if some military advantage seemed likely to accrue. For Japanese political policy towards the occupied areas was to fan anti-White feeling and Far-Eastern Asian solidarity. In this they had great success, to be seen in the rise of the originally pro-Japanese nationalist movements of Indonesia and Burma. It would have been a most foolish act of the Japanese to have attacked the civilian Asian populations, whom they saw—and saw correctly in many cases—as allies against their American and British enemies.

It is important to note that Japan's opening stroke of the war—the attack on Pearl Harbour before the declaration of war—was not an area attack on the civilian population of a city, but a brilliantly successful attack on American naval and military power in the Pacific. Even so, it was amply adequate to bring into the war an America bitterly determined to defeat Japan.

¹ *Summary Report (U.S.S.B.S., 4).*

In this connection it is of interest to study the overall strategic plan of the Japanese war leaders. The essence of their plan has been summarized by the American Survey in the following way:

(a) The threat of Russia on the Manchurian flank had been neutralized by the decisive victories of Germany in Europe, which might eventually lead to the complete collapse of the Soviet Union.

(b) Great Britain was in such an irretrievably defensive position that, even if she survived, her entire war-making potential would be spent in a desperate effort to protect her home islands.

(c) The forces which the United States and her Allies could immediately deploy in the Pacific, particularly in the air, were insufficient to prevent the fully trained and mobilized forces of Japan from occupying, within three or four months, the entire area enclosed within a perimeter consisting of Burma, Sumatra, Java, northern New Guinea, the Bismark Archipelago, the Gilbert and Marshall Islands, Wake, and from there north to the Kuriles.

(d) China, with the Burma Road severed, would be isolated and forced to negotiate.

(e) The United States, committed to aiding Great Britain, and weakened by the attack on Pearl Harbour, would be unable to mobilize sufficient strength to go on the offensive for eighteen months to two years. During this time, the perimeter could be fortified and the required forward air fields and bases established. So strengthened, this perimeter would be backed by a mobile carrier striking force based on Truk.

(f) While the stubborn defence of the captured perimeter was undermining American determination to support the war, the Japanese would speedily extract bauxite, oil, rubber and metals from Malaya, Burma, the Philippines and the Dutch East Indies and ship these materials to Japan for processing, to sustain and strengthen their industrial and military machine.

(g) The weakness of the United States as a democracy would make it impossible for her to continue all-out offensive action in the face of the losses which would be imposed by fanatically resisting Japanese soldiers, sailors, and airmen, and the elimination of its Allies. The United States in consequence would compromise and allow Japan to retain a substantial portion of her initial territorial gains.

Certain civilian and naval groups were familiar with the United States, its industrial and technological potential, and probable fighting determination when aroused. They expressed

doubts about a strategy which promised no conclusion to the war other than negotiation, and which thus might drag out interminably with consequent risk of defeat. The Navy, however, was gravely concerned about its declining oil supply after the United States and the British economic embargo of July 1941. Such civilians as were reluctant were overruled and went along with the more dynamic opinion.

None of the responsible Japanese leaders believed that within any foreseeable period of time Japan could invade the United States and dictate peace in the White House. Admiral Yamamoto's supposed boast that Japan would do so was in fact never made. These leaders furthermore felt that Japan's limited shipping would be strained to the utmost in providing logistic support for the plan adopted and would be wholly inadequate for any more ambitious programme, unless the initial operations went unexpectedly well.

Pearl Harbour led directly to the Japanese defeat, because, though tactically successful, it could not be followed up. It left America with essentially unimpaired military and industrial resources free to prepare Japan's final overthrow. To have substituted for the actual attack on the American armed forces, a mass attack, say, on Honolulu, would have made the ultimate outcome still more certain. The Japanese military leaders were not so stupid as all that.

The Japanese expansive tide finally came to an end, meeting its first decisive check in the naval battle of the Coral Sea in May 1942. Then, slowly at first, but gradually acquiring increasing momentum, began the return tide of the American counter-offensive in the Pacific and that of the British in Burma. In a series of bitterly fought actions, American Naval, Army and Air Force units, co-operating intimately, gradually advanced, island by island, atoll by atoll, across the Pacific, ever closer towards the Japanese homeland. These brilliantly conducted operations provide admirable examples of the co-operation of all three arms and, in particular, of the essentially tactical use of aircraft, including heavy bombers. By the spring of 1945, the assault on the Japanese mainland became possible.

It is useful to consider the overall state of Japanese war potential in March 1945, at the time of the launching of the heavy bombing offensive against the Japanese home islands. In spite of the remarkable expansion of Japan's industry in the years before Pearl Harbour, her industrial production at the outset of the war did not amount to more than 10 per cent of that of the United States. By the time of the start of the mass bombing of Japanese cities, the Allied counter-offensive had driven her back—either by direct conquests, by-pass-

ing or blockade—to the islands of the homeland. Her Navy had been reduced to insignificant proportions and her merchant marine had been destroyed or immobilized by blockade. American air ascendancy was absolute over the remaining outlying Japanese-held areas and already partially achieved over the home islands.

Oil imports . . . had been eliminated by April 1945. Crude oil stocks were virtually exhausted; refinery operations had to be curtailed; and stocks of aviation gasoline fell to less than 1,500,000 barrels, a point so low as to require a drastic cut in the field training programme and even in combat air missions. Bauxite imports declined from 136,000 tons in the second quarter of 1944, to 30,000 tons in the third . . . by November 1944, the overall level of Japanese war production had begun to turn down, including even the highest priority items, such as aircraft engines (*U.S.S.B.S.* 4, p. 15).

From 1942 onwards, the Japanese merchant fleet declined continuously as a result of heavy losses, and at the end of the war it amounted to little more than 10 per cent of its original tonnage. Nearly nine million tons of shipping were sunk or so seriously damaged as to be out of action at the end of the war. Of this total, 54 per cent was due to submarines and 40 per cent to aircraft, including air-laid mines. The Japanese Navy at the beginning of the war consisted of 381 warships, amounting to 1,270,000 tons, to which an additional 816 ships, totalling 1,048,000 tons, were added during the war. The number sunk was 549, totalling 1,744,000 tons, leaving only 196,000 tons still afloat at the end.

After the liberation of the Philippines and the capture of Okinawa (March 1945), oil imports into Japan were completely cut off; fuel stores had been exhausted; and the few remaining Japanese warships, being without fuel, were de-commissioned or were covered with camouflage and used only as anti-aircraft platforms. Except for its shore-based Kamikazi air force, and surface and under-sea craft adapted for anti-invasion suicide attack, the Japanese Navy had ceased to exist (*U.S.S.B.S.* 4, p. 11).

However, at the time of the surrender some 5,400 suicide planes were still available.

It is the opinion of the Survey that by August 1945 even without direct air attack on her cities and industries, the overall level of Japanese war production would have declined below the peak levels of 1944, by 40 per cent to 50 per cent solely as a result of the interdiction of overseas imports (*Ibid.*, p. 15).

It is in the light of these decisive successes by the American land, sea and air forces that we must judge the effect of the bombing offensive on the Japanese home islands. The possibility of large-scale mass attacks on the cities of Japan waited on the provision of air bases within 1,500 miles of the target. Long-range bombing by B29 bombers started in a small way from the Mariannas in November 1944, but only 8,000 tons were dropped by the end of February 1945, and these were aimed at 'point' targets such as aircraft factories, etc. The deliberate campaign of mass attack on Japanese cities did not start until 9 March, with a devastating raid on Tokyo—the most devastating raid yet made, not excluding those with atomic bombs.

We can summarize the bombing offensive against the Japanese home islands from 9 March 1945 to the dropping of the first atomic bomb on 6 August, by the following figures. Of the 660,000 tons of bombs dropped by Allied planes in the Pacific War, 160,000 (24 per cent) were dropped on the homeland. The monthly tonnage of bombs dropped increased from 13,800 in March to 42,700 in July. The number of civilians killed amounted to about 220,000; that is, about 1.3 killed per ton. About 100,000 tons of this total were dropped on sixty-six urban areas, and so come into the category of the use of a weapon of mass destruction; the remaining 60,000 tons were dropped on specific military and industrial targets.

Some 3,000,000 houses were destroyed either by the raids or by demolition to create fire breaks. About a quarter of the population of the cities fled or was evacuated, leading to a mass migration of some 8,500,000 people. Reduction of industrial capacity by the air attacks from their pre-raid values ranged from almost 80 per cent for oil refineries and aircraft engine plants, to 10–20 per cent for steel, light metals and chemicals.

The Survey states that it was not able to disentangle completely the effects of the area and the precision attacks.

Even though the urban area attacks and attacks on specific industrial plants contributed a substantial percentage to the overall decline of Japan's economy, in many segments of that economy their effects were duplicative. Most of the oil refineries were out of oil, the alumina plants out of bauxite, the steel mills lacking in ore and coke, and the munition plants low in steel and aluminium. Japan's economy was in large measure being destroyed twice over, once by cutting off imports, and secondly by air attack (*U.S.S.B.S.* 4, p. 19).

On 6 August 1945 the first atomic bomb was dropped on Hiroshima and on 9 August the second on Nagasaki. On 14 August the Japanese Government surrendered unconditionally.

We can now summarize the events of the Pacific War that have special relation to the question of the use and efficacy of weapons of mass destruction in the following conclusions. The Japanese, in their brilliantly successful campaigns of 1941 and 1942, neither needed nor used weapons of mass destruction, but relied on highly co-ordinated operations of all arms directed against enemy forces and communications. In this campaign the invaders had reason to expect and actually obtained active support from a substantial fraction of the population of the invaded countries. Under these circumstances, tactics of mass destruction would have been highly detrimental to Japanese interests. It is interesting to compare these circumstances with those of the advance of the German Wehrmacht over Western Europe in 1940. Here, also, the invader expected and received aid from a certain fraction of the population of the invaded countries, and this, no doubt, constituted an added reason for not making use of weapons of mass destruction. There was, however, a difference of some importance between the two circumstances. In the Far Eastern war, the fact that the invaded countries were colonies led to a substantial fraction of the mass of the population, including most of the nationalist elements, siding with the invaders, whereas in Europe the aid received by the Nazis came from a small section of the population, without substantial mass support.

The Allied counter-offensive, from 1943 to March 1945, consisted of a similar series of combined operations directed against enemy armed forces and sea transport. Till the latter date it was technically impossible to engage in heavy bombing of Japanese cities owing to lack of suitable bases. By March 1945 Japan's defeat was certain, the decisive element being that her home islands were cut off from the rest of her short-lived empire, on which she relied for supplies. Japanese war production was dropping rapidly at the end of this period.

The all-out air attack on Japan from the Marianas, which began in March 1945, accelerated markedly the rate of collapse of Japanese war potential and led, in the view of the Survey, to a high probability that Japan would have surrendered during the summer or autumn of 1945, even if the atomic bombs had never been dropped, and the Russian offensive in Manchuria had never taken place.

As has already been emphasized, this air campaign consisted of precision attacks on military targets, together with devastating attacks on cities, but it is not possible fairly to apportion the results achieved between the two. But attributing, as is legitimate, a substantial part of the effects to the area attacks, one can conclude that this campaign of mass destruction by air attack was the first fairly successful one in history. On the other hand, it is quite likely that victory could have been achieved without it.

The conditions under which this success was achieved need careful consideration. The first was the attacking Power expected no help from, nor had any sympathy with, the attacked population. The second was the attacking Power's overwhelming superiority in war production which made it possible for the air offensive to be planned on a continually increasing scale. Thirdly, as a result of this superiority in air power, complete air supremacy was established over the target area, and there was little danger of a decisive counter-attack even on the advanced air bases from which the assault on Japan was being staged. Fourthly, the country attacked had already been decisively defeated in three years of bitter fighting and was on the verge of economic collapse.

CHAPTER IV

THE ATOMIC BOMB AS A WEAPON

So much has been written of the effects on Hiroshima and Nagasaki of the explosion of the two bombs, that it is only necessary here to survey briefly the main facts. The chief sources of information which will be used are the British¹ and American² official reports.

The attacks were launched from the Island of Tinian by B29 aircraft carrying the bombs, accompanied in each case by one or two observation planes. The first bomb exploded at 8.15 a.m. on the morning of 6 August over Hiroshima.

Most of the industrial workers had already reported to work, but many workers were *en route* and nearly all school children and some industrial employees were at work in the open on the programme of building removal to provide fire-breaks and disperse valuables to the country. The attack came forty-five minutes after the 'all clear' had been sounded from a previous alert. Because of the lack of warning and the populace's indifference to small groups of planes, the explosion came as an almost complete surprise and the people had not taken shelter. Many were in the open, and most of the rest in flimsily constructed homes or commercial establishments (*U.S.S.B.S.*, 5, p. 3).

About 4.4 square miles of the city were completely burnt out.

The surprise, the collapse of many buildings, and the conflagration contributed to an unprecedented casualty rate. Seventy to eighty thousand people were killed, or missing and presumed dead and nearly an equal number were injured. The magnitude of the casualties is set in relief by a comparison with the Tokyo raid of 9-10 March 1945, in which, though nearly sixteen square miles were destroyed, the number killed was no larger. . . .

At Nagasaki, three days later, the city was scarcely more prepared, though vague references to the Hiroshima disaster had appeared in the newspaper of 8 August (*Ibid.*).

¹ *The Effects of the Atomic Bombs on Hiroshima and Nagasaki* (British Report). London, 1946.

² *United States Strategic Bombing Survey. Summary Report (Pacific War)*. (*U.S.S.B.S.*, 4.)
United States Strategic Bombing Survey, Effect of Atomic Bombs. (*U.S.S.B.S.*, 5.)

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Thus when the bomb was dropped no raid warning was given and so only some 400 people were in the city's tunnel shelters, which had a capacity for about 30 per cent of the population. *hst*

Eye witnesses in Hiroshima were agreed that they saw a blinding white flash in the sky, felt a rush of air and heard a loud rumble of noise, followed by the sound of rending and the falling of buildings. All also spoke of the settling darkness as they found themselves enveloped by a universal cloud of dust. Shortly afterwards they became aware of fires in many parts of the city (*British Report*, p. 2).

The following table, extracted from *U.S.S.B.S.*, 5, gives some numerical details of the effects of the two atomic bombs, together with the effects of the great fire raid on Tokyo in March 1945, and the average effects of a large number of other attacks on Japanese cities. The great difference between the casualties in the Tokyo raid compared with all subsequent raids with normal high explosives and incendiary bombs is to be ascribed mainly to the lack of warning and of preparation to meet this type of attack.

Effort and Results

	Hiroshima	Nagasaki	Tokyo	Average of 93 urban attacks
Planes	1	1	279?	
Bomb load	Atomic bomb	Atomic bomb	1,667 tons normal bombs	1,129 tons normal bombs
Population density per square mile	35,000	65,000	130,000	
Square miles destroyed	4.7	1.8	15.8	1.8
Killed and missing	70-80,000	35-40,000	83,600	1,850
Injured	70,000	40,000	102,000	1,830
Mortality rate per sq. mile destroyed	15,000	20,000	5,300	1,000
Casualty rate per sq. mile	32,000	43,000	11,800	2,000

The plutonium bomb used at Nagasaki had a 15 per cent greater radius of destruction than the Uranium 235 bomb used at Hiroshima.¹ The lower casualties at the former city were mainly due to the uneven terrain, which shielded parts of the city from the effects

¹ *Senate Committee on Atomic Energy*. Nitze, 15 Feb. 1946.

of the bombs. The figures in the table show that the population density at Tokyo was much greater than at the two other cities; so, if an atomic bomb had been dropped on the former city, the casualties would have been two to three times as heavy as they actually were at Hiroshima.

The effects of the explosion are described in the following passage:

At the time of the explosion, energy was given off in the forms of light, heat, radiation, and pressure. The complete band of radiations, from X and gamma rays, through ultra-violet and light rays to the radiant heat of infra-red rays, travelled with the speed of light. The shock wave, created by the enormous pressure, built up almost instantaneously at the point of the explosion but moved out more slowly, that is at about the speed of sound. The superheated gases constituting the original fire ball expanded outwards and upward at a slower rate. . . . The duration of the flash was only a fraction of a second, but it was sufficiently intense to cause third degree burns to exposed human skin up to a distance of a mile. . . . In the immediate area of ground zero (the point on the ground immediately below the explosion), the heat charred corpses beyond recognition (*U.S.S.B.S.*, 4, p. 22).

Clothing or light buildings provided considerable protection from the flash. Penetrating gamma rays and neutrons affected the bone marrow of people near the centre of the explosion, but the effects took several days to develop, death occurring soon after. Though these radiations are very penetrating, it was found that a few feet of concrete provided adequate protection even close to ground zero. The majority of the casualties resulted from the collapse of buildings through blast, and from the subsequent fires, some of which were due to the direct effect of the radiant heat and some to the overturning of domestic stoves, etc., in the wrecked buildings.

The blast wave which followed the flash was of sufficient force to press in the roofs of reinforced concrete structures and to flatten completely all less sturdy structures. Due to the height of the explosion, the peak pressure of the wave at ground zero was no higher than that produced by a near miss of a high explosive bomb and decreased at greater distances from ground zero. The blast wave, however, was of far greater extent and duration than that of a high explosive bomb and most reinforced concrete structures suffered structural damage or collapse up to 700 feet at Hiroshima and 2,000 feet at Nagasaki. Brick buildings were flattened up to 7,300 feet at Hiroshima and 8,500 feet at Nagasaki (*U.S.S.B.S.*, 4, p. 23).

From the official reports we can obtain a clear picture of the overall effects of the two bombs on the life of the two cities.

Both at Hiroshima and Nagasaki the scale of the disaster brought city life and industry virtually to a standstill. Even the most destructive conventional attacks, the incendiary raids on Hamburg in the summer of 1943, and on Tokyo in the spring of 1945, had no comparable effect in paralysing the communal organization (*British Report*, p. 3).

At Hiroshima the effects are reported as follows:

Of approximately 90,000 buildings in the city, 65,000 were rendered unusable and almost all the remainder received at least superficial damage. The underground utilities of the city were undamaged except where they crossed bridges over rivers cutting through the city. All the small factories in the centre of the city were destroyed. However, the big plants on the periphery of the city were almost completely undamaged and 94 per cent of the workers unhurt. These factories accounted for 74 per cent of the industrial production of the city. It is estimated that they could have resumed substantial normal production within thirty days of the bombing, had the war continued. The railroads running through the city were repaired for the resumption of through traffic on 8 August, two days after the attack (*U.S.S.B.S.*, 4, p. 23).

At Nagasaki the results were rather different. Some 20,000 of the 57,000 houses were destroyed or badly damaged. The effect on industry is reported as follows:

Had the war continued, and had the raw material position been such as to warrant their restoration, it is estimated that the dockyard could have been in a position to produce at least 80 per cent of its full capacity within three or four months; that the steel works would have required a year to get into substantial production; that the electric works could have resumed some production within two months and been back at capacity within six months; and that restoration of the arms plant to 60-70 per cent of former capacity would have required fifteen months (*Ibid.*).

Much has been written of the possibility of passive defence measures designed to reduce damage and casualties. All the evidence is that, except in the case of surprise attack, both damage and casualties could be reduced to a small fraction of what they were in Japan provided that sufficient cost in capital investment and interference with many aspects of normal civilian life can be faced. The view of the American Survey is clearly stated thus.

The experience of both the Pacific and European wars emphasizes the extent to which civilian and other forms of passive defence can reduce a country's vulnerability to air attack. Civilian injuries and fatalities can be reduced, by presently known techniques, to one-twentieth or less of the casualties that would be suffered were these techniques not employed. . . .

The most instructive fact at Nagasaki was the survival, even when near ground zero, of the few hundred people who were placed in tunnel shelters. Carefully built shelters, though unoccupied, stood up well in both cities. Without question, shelters can protect those who get to them against anything but a direct hit. Adequate warning will assure that a maximum will get to shelters. . . .

Analysis of the protection of survivors within a few hundred feet of ground zero shows that shielding is possible even against gamma rays. Adequate shelters can be built which will reduce substantially the casualties from radiation. . . .

It appears that a few feet of concrete, or a somewhat greater thickness of earth, furnished sufficient protection to humans, even those close to ground zero, to prevent serious after effects from radiation. . . .

Men arriving at Hiroshima and Nagasaki have been constantly impressed by the shells of reinforced concrete buildings still rising above the rubble of brick and stone or the ashes of wooden buildings. In most cases gutted by fire or stripped of partitions these buildings have a double lesson for us. They show, first, that it is possible, without excessive expense to erect buildings which will satisfactorily protect their contents at distances of about 2,000 feet or more from a bomb of the types so far employed. Construction of such buildings would be similar to earthquake resistant construction, which Californian experience indicates would cost about 10 per cent to 15 per cent more than conventional construction.

Protection of personnel against the heat radiation is relatively easy as quite a light covering of material will absorb most of the heat radiation.

A detailed analysis of the damage to different types of structure leads to the figures given in the following table, for the average radii and areas of damage for different types of buildings at Hiroshima and Nagasaki.¹ As an overall figure for an average town, we will take it that one plutonium atomic bomb causes severe damage over an area of eight square miles.

¹ Coale, *Vulnerability to Atomic Bombs*, p. 73. Princeton, 1947.

Type of structure	Area of severe damage	Radii of severe damage
	sq. miles	yards
Reinforced concrete buildings	0.43	700
Heavy steel frame buildings	1.8	1,400
One storey brick buildings	8.1	2,600

A plutonium bomb produces a blast wave comparable to that which would be produced by the explosion of one lump of 20,000 tons of T.N.T.¹ From careful surveys of the damage, it has been calculated, however, that only a little over 2,000 tons of high explosive bombs—for example, ten-ton blockbusters—would be required to produce the same structural damage as one plutonium bomb. The reason why this figure is so much lower than the figure of 20,000 tons for the equivalent amount of T.N.T. when exploded in one mass, lies in the fact that such a very large explosion pulverizes near-by objects to a quite unnecessary degree; in fact, it 'overhits' the central part of target area, and so wastes a large part of the energy.

The calculation runs as follows: 'At Nagasaki, brick buildings within 6,000 feet of ground zero were structurally damaged. From surveys of damage by ordinary bombs we know that the corresponding distance for, say a ten-ton high explosive bomb is 400 feet.'² Hence the area adequately destroyed by a plutonium bomb is $(6,000/400)^2 = 225$ times that produced by a ten-ton bomb. Consequently, one plutonium bomb does about the same effective damage as some 2,250 tons of ordinary bombs properly distributed over the target. It is well known that the area damaged by a given weight of ordinary bombs varies rather little with the size of the bombs; for instance, roughly the same damage would be done by 200 ten-ton bombs, and 2,000 one-ton bombs.

A rather similar estimate of the number of ordinary bombs equivalent to one atomic bomb is given in the official documents submitted by the United States to the United Nations Atomic Energy Commission.³ A plutonium bomb is estimated to do as much structural damage as 167 ten-ton 'blockbusters', each of which contains five tons of T.N.T. So on this calculation one atomic bomb is equivalent in respect of damage to 1,670 tons of ordinary bombs.

Actually the practice developed during the war of dropping a mixed load of high explosive and incendiary bombs so as to produce the maximum total damage and casualties. The American report calculated the equivalent mixed load as follows:

¹ *British Report*, p. 4.

² *U.S.S.B.S.*, 5, p. 33.

³ *A.E.C., Scientific Information*, Vol. I, p. 37.

On the basis of the known destructiveness of various bombs computed from the war in Europe and the Pacific and from tests, the Survey has estimated the striking force that would have been necessary to achieve the same destruction at Hiroshima and Nagasaki. To cause physical damage equivalent to that caused by the atomic bombs, approximately 1,300 tons of bombs (one-fourth high explosives and three-fourths incendiaries) at Hiroshima and 600 tons (three-fourths high explosives and one-fourth incendiaries) would have been required at Nagasaki—in the target area. To place that many bombs in the target area, assuming daylight attacks under essentially the same conditions of weather and enemy opposition that prevailed when the atomic bombs were dropped, it is estimated 1,600 tons of bombs would have had to be dropped at Hiroshima and 900 tons at Nagasaki. To these bomb loads would have had to be added a number of tons of anti-personnel fragmentation bombs to inflict comparable casualties. These would add about 500 tons at Hiroshima and 300 tons at Nagasaki. The total bomb load would be thus 2,100 tons at Hiroshima and 1,200 tons at Nagasaki. With each plane carrying ten tons, the attacking force would have been 210 B29's at Hiroshima and 120 B29's at Nagasaki.

In view of the unevenness of the terrain at Nagasaki, the figures for the Hiroshima bomb can be taken as the more typical.

A rough average of these various estimates gives us the result that one plutonium bomb is about equivalent to 2,000 tons of ordinary high explosive bombs as regards the structural damage produced.

It is less easy to give a reliable equivalence for the civilian casualties produced by atomic and ordinary bombing. These depend to a very large extent on the distribution of the people at the times of the attack between open places, ordinary houses, reinforced concrete buildings or specially constructed shelters, and so will be much greater for a surprise attack on an unprepared city than for an expected attack on a prepared city. It is not clear what assumptions as to these factors were made to obtain the figures quoted above, and it seems possible that this American report has underestimated the effectiveness of atomic bombs to produce civilian casualties in any but a very well prepared city. For instance, the 9 March raid on Tokyo with normal bombs killed some 80,000 people; that is, nearly the same number as at Hiroshima. But the population density in the former city was four times that in the latter, so, had the atomic bomb been dropped on Tokyo, one would have expected some 300,000 killed. To achieve this result with

normal bombs would probably have required some 6,000 to 10,000 tons of ordinary bombs.

Lacking, therefore, a firm basis on which to revise the figures of equivalence of one plutonium bomb to some 2,000 tons of ordinary bombs given by the American Survey, we will adopt this on a provisional basis for further calculations, remembering that in some circumstances the figure may require considerable modification. In the case of possible surprise attacks at the outset of a war, the personal casualties would be higher than is indicated by this equivalence, but in a long-drawn-out war, when there is time for defensive preparation to be made, the figure may be taken as a rough numerical guide as to what may be expected to occur.

The B29 aircraft used in the attack on Japan are very vulnerable to contemporary fighters and certainly could not have been sent alone against a reasonably well-defended target. If Japan had, for instance, possessed an air defence system comparable with that, say, of Britain or Germany in 1943 or 1944, it would certainly have been necessary to send a large number of bombers to Hiroshima and Nagasaki, and probably also to have given them an escort of fighters.

The conditions of the air war over Japan in August 1945 must be remembered. Air supremacy over the target area had already been attained so that there appears to have been no effective fighter or A.A. opposition. An additional cause of the lack of opposition to the atomic bombing lay in the fact that the Japanese had ceased to attempt to interfere with the reconnaissance flights that were a daily occurrence at that time. Thus, when three aircraft appeared on the morning of 6 August, no attempt at defence measures was made.

It is the opinion of the Survey that, with present types of aircraft, a day offensive against a well-defended country could not be sustained on a large scale without control of the air; that is, with present aircraft not outside the range of fighter cover.¹ At any rate it is clear that had Japanese air defence been reasonably efficient at that time, it would have been necessary to send the aircraft which carried the atomic bomb not by day accompanied only by two observation planes as was done, but either by night, or if by day, then accompanied by a considerable number of other B29's to give mutual protection and to divide the defence.

Control of the air over the Japanese home islands was only achieved slowly and with difficulty. Of major importance in attaining this air superiority was the great deterioration that had taken place in the skill and training of the Japanese pilots. This had two main origins—the loss of nearly all the very highly skilled pilots with

¹ U.S.S.B.S., 4, p. 19.

whom Japan had started the war, as a result of the bitter fighting of the previous three years, and the impossibility of replacing them owing to shortages, particularly of petrol, which drastically curtailed the training programme.

It is not possible without further assumptions to estimate more than roughly the number of aircraft which would have been needed against strong defences, but it is unlikely that the American air staff would have contemplated a day attack, say on a German city in 1943, from bases 1,500 miles away, with less than 50 B29's, if they had considered it possible at all. Looked at from this point of view, the statement in the report,¹ that the figures in the table on p. 38 'shows most strikingly the comparison between the striking forces needed for atomic and for conventional raids', must be understood as applying to the very special conditions of the Japanese War in August 1945.

In another part of the report we find the statement:

The atomic bomb in its present state of development raises the destructive power of a single bomber by a factor of between 50 and 250 times, depending upon the nature and size of the target. The capacity to destroy, given control of the air and an adequate supply of bombs, is beyond doubt. Unless both of these conditions are met, however, any attempt to produce war-decisive results through atomic bombing may encounter problems similar to those encountered in conventional bombing (*U.S.S.B.S.*, 4, p. 29).

It is useful to pursue this point somewhat further, as it is of great importance for estimating the future. Consider, for instance, an imaginary raid on Germany in 1943 with fifty B29 aircraft carrying one or more atomic bombs. If all fifty aircraft carried atomic bombs then, since one bomb can be taken as destroying about eight square miles of a city, the raid as a whole could destroy 400 square miles. No single city on the European mainland approaches this size, but Greater London is considerably larger.

If the target were a moderate-sized city with an area of, say, eight square miles, then one atomic bomb would be ample to destroy it all, and it would be pointless to drop more. So, in this case, the raid of fifty aircraft, with only one carrying an atomic bomb, would be only some six times as effective as the same raid with no atomic bombs.² If the target were quite small, say, an isolated industrial plant, with an area of 1 square mile, then the fifty aircraft which

¹ *U.S.S.B.S.*, 5, p. 33.

² Fifty B29's would carry 500 tons of ordinary bombs, whereas forty-nine with ordinary bombs and one with an atomic bomb would carry the equivalent of under 3,000 tons of ordinary bombs, giving a 1 to 6 ratio.

would have to be sent would be able to destroy it with ordinary bombs. Thus no gain would accrue from the use of atomic bombs.

We can sum up the question of the relative number of aircraft sorties required to destroy a given target with high explosives and ordinary bombs, by noting that this depends essentially on two factors: (a) the degree of the opposition, and so the total number of aircraft that must be dispatched; and (b) the size of the target. With negligible opposition, and any target with an area greater than, say, eight square miles, some 200 sorties by B29 aircraft with H.E. bombs would be required to equal the effect of one sortie with an atomic bomb. This was the case at Hiroshima and Nagasaki. Against heavy opposition, this equivalence is still maintained if the target is exceedingly large; but for smaller target sizes, the relative value of the atomic bomb falls off, till for quite small targets and very heavy opposition it offers little advantage over ordinary bombs. In this sense the special properties of the atomic bomb makes it essentially a weapon for very large targets when used strategically. Since there are few targets large enough to bring out its full advantage, other than great cities, it tends to become inevitably considered as only a weapon of mass destruction. In the next chapter the tactical use of atomic bombs will also be considered.

CHAPTER V

FUTURE TECHNICAL DEVELOPMENTS

In order to assess the influence of atomic bombs on the course of a future war, it is necessary to estimate what changes are likely to occur by a given date in (a) the destructiveness of the bombs, (b) the methods of conveying the bombs to the target, (c) the active defence against the aircraft or rocket carriers, and (d) the passive defence measures which each country may adopt. These various factors will be discussed in turn; in general we will consider mainly advances that are likely to be achieved, firstly, within the next five years, that is, by 1953, and secondly within the next ten years, that is by 1958. For the choice of these time scales there are certain definite reasons.¹

It is clear that the only war in which atomic bombs are likely to be used is one in which the main contestants are the United States of America and the U.S.S.R. A period of five years from now is the latest possible date at which one could reasonably expect that the U.S.S.R. would not possess at least some atomic bombs. This is therefore the latest possible date at which a war between these two countries might occur with only one of them, America, possessing atomic bombs. The period of ten years is chosen as the latest date at which it is at all reasonable to attempt to predict the pattern of future events.

Much has been published on the future of all these four factors but of especial importance are an article by General Arnold² and two which give the American Army³ and Navy⁴ views. A critique of the two latter papers has been given by Bernard Brodie.

¹ In the *Compton Report*, p. 12, which is discussed in Appendix V, we read 'As has been noted, we cannot safely assume that we will have sole possession of atomic explosives beyond 1951, although most scientists and engineers familiar with the production of the atomic bomb believe it will be 1955 at the earliest before an attack in quantity can be made against us.'

² 'Air Force in the Atomic Age.' Article by General Arnold in *One World* None, McGraw Hill, New York, 1946 (Owon).

³ *The Effect of the Atomic Bomb on National Security*. (An expression of War Department Thinking) as submitted to Congress and reprinted in the *Army-Navy Journal* for 12 April 1947. Reprinted in *B.A.S.*, June, 1947 (War Dept.).

⁴ 'Navy Department Thinking on the Atomic Bomb,' *B.A.S.*, July 1947. The summary of Navy Thinking was prepared by Brodie after interviews with Admiral Nimitz and other senior naval officers. Brodie is a member of the Institute of International Studies, Yale University (Navy Dept.).

⁵ Brodie. *Bulletin of Atomic Scientists* August, 1947 (*B.A.S.*).

FUTURE TECHNICAL DEVELOPMENTS

There has been much discussion of the possibility of a 'super bomb' probably using a nuclear reaction involving hydrogen or lithium initiated by the explosion of a plutonium or uranium 235 bomb. By this means scientists believe that an explosive power many times as great might be produced. However, this has so far not yet apparently been achieved, and its likely performance is still highly speculative.²

An increase in the explosive power of a bomb would yield increased results when the target is a large city, but it must be remembered that the present bombs¹ are already unnecessarily powerful for use against many small but important targets such as a single factory or a single large ship. On the other hand, even for a small target, the bigger the power of the explosive bomb, the larger the permissible aiming error. Very considerable military advantage would, however, be gained if atomic bombs could be made (a) of less all-up weight, and (b) containing less fissile material. For a smaller or lighter bomb could be carried in a smaller and faster aircraft, or as the war-head of a V2 weapon of reasonable size. And a bomb with less fissile material would allow more but less powerful bombs to be produced. For many military purposes, much greater results could be obtained if either or both of these objectives could be attained. Almost certainly some advances in these directions will be made, but the known physical principles underlying the 'critical size' of a bomb of fissile material make rather unlikely a great reduction in the minimum amount of fissile material in a bomb of anything like the present type.

No official figures have been given for the all-up weight of the atomic bomb. It is only possible therefore to quote various appar-

¹ The most detailed account of the physics of the super-bomb, that has been published, appears to be that by Hans Thirring in *Die Geschichte der Atombombe*, published in Vienna in 1946. Published physical data is used to estimate the energy release obtainable in theory by using the high temperature produced by a uranium bomb to initiate a hydrogen-helium, or a lithium-helium reaction.

Thirring points out that, since lithium is a common element, bombs with a much larger amount of fissile material would be more economical than is the case with scarce uranium. He envisages bombs with six tons of lithium as possibly giving one thousand times as much energy as simple uranium bombs. A bomb of this type, with its complicated activating mechanism, would certainly weigh considerably more than plutonium bombs. It is clear that super-bombs will require larger carriers than ordinary atomic bombs.

² For instance John J. McCloy, former Assistant Secretary of War, is reported as stating that '... there can be little doubt that within the next ten years, to be conservative, bombs' (of the same type as those already used) 'of the power equivalent to 100,000 to 250,000 tons of T.N.T. can be made, something over ten times more powerful than the bombs dropped on Hiroshima. And if we can move to the other end of the periodic table and utilize hydrogen in the generation of energy, we could have a bomb somewhere around a thousand times as powerful as the Nagasaki bomb.' *B.A.S.*, Vol. 3, p. 5, Jan. 1947.

ently well-informed statements. Brodie writes:¹ 'The gross weight of the bomb is still secret, but even if it weighed four to six tons it would still be a light load for a B29'; and also: 'If it be true, as has been hinted, that the B29 is the only existing bomber that carries the atomic bomb, the fact might argue an even greater gross weight for the bomb than that surmized above.' These statements seem to put the all-up weight as lying between four tons and ten tons, as the latter is the maximum bomb load of a B29.

As no details have been published as to the actuating mechanism it is not possible to attempt to estimate to what extent the gross weight of the bomb may be reduced in the future. This is of course a matter of great importance in view of the influence on the design of the aircraft or rockets to carry the bombs.

To allow for some increase in the explosive power of the bomb in the next few years, we will base our discussion on the assumption that the explosive force will be twice that of the one used at Nagasaki; that is, the improved bomb will be assumed to have an explosive power of some 40,000 tons of T.N.T. exploded in one place. Since the early atomic bombs produced about as much destruction as 2,000 tons of ordinary bombs, and since the area of destruction increases more slowly than the explosive force, we will assume that the improved bomb will have the same destructive power as 3,000 tons of ordinary bombs.

Though rockets of the German V2 type might possibly be built to carry an atomic war-head a distance of a few hundred miles, the technical problem of making such a rocket with a range of a 1,000 miles or more is very formidable. The view of the American Navy has been expressed as follows: 'For these and other reasons not here touched upon, it seems a wholly reasonable and safe assumption that rockets with atomic war-heads capable of thousands of miles of range are not to be expected for at least twenty-five years.'

It will be remembered that the German V2 weapon had an all-up weight of fourteen tons and carried a war-head of one ton a distance of 200 miles, with an average accuracy of about four miles. As a basis for the subsequent discussion of the strategic effects of atomic bombs, we will make the assumption that within the next ten years, that is, till 1958, rockets of the V2 type will not be able to deliver atomic war-heads a distance greater than a very few hundred miles, and that the mean aiming error at this range will not be less than a few miles.

Since no effective method of destroying rockets in flight has

¹ Brodie, *The Absolute Weapon*, pp. 37 and 38.

² Navy Dept.

apparently yet been devised, and since none seems in sight, we will assume that there will be no such method within the next ten years.

Mention must also be made of the probable developments of pilotless aircraft, of which the German V1 was the first and, so far, the only type used operationally. The balance of advantage in dispensing with a pilot is always a very difficult one to estimate, as it involves gauging numerically the relative advantages of increased performance, in range or speed, or both, against the loss of the power of human intelligence to find the target or evade counter-measures. Undoubtedly there are circumstances in which a pilotless aircraft has some advantages over piloted aircraft, particularly at ranges of a few hundred miles. But at ranges of a few thousand miles, their greater vulnerability, due to their lower capability of taking evasive action, combined with the difficulty of guiding them to a target, would seem to make them nearly useless for attack on specific small targets.

It will be remembered that the German V1 weapon had an all-up weight of three tons, and carried a one-ton war-head a distance of 200 miles at a speed of 350 m.p.h. The average aiming error was about five miles, that is, about one fortieth of the range. Within three months of the start of the attacks, fighters and anti-aircraft fire shot down 80 per cent of those launched at London from the French coast.

The angular accuracy achieved with this weapon would be quite useless at ranges of 1,000 miles or so, as it would give an aiming error of some twenty-five miles. In fact, for all pilotless weapons, whether of the rocket or aircraft type, which are to be used at ranges of over a few hundred miles, some form of guiding seems essential, if a worth-while accuracy is to be attained. But no such devices seem likely within the next ten years to be accurate enough to deliver an appreciable fraction of missiles into any target smaller than a large city at a 1,000 miles range.¹

As a basis for our discussion, we will make the assumption that no type of pilotless aircraft or rocket is likely to be useful for attack, at a range of 1,000 miles, on such a small target as a single factory, or an atomic bomb plant, at least for very many years. As already shown in the table on p. 41, the radius of action of an atomic bomb against ordinary reinforced concrete buildings is only 700 yards—an entirely impossible accuracy for pilotless weapons at great ranges. It is obvious that an atomic bomb plant would be specially strengthened so as to be almost completely immune to a bomb exploded high up, as the bombs were over Japan. If the height of explosion is

¹ For a discussion of the problem of guiding long-range rockets, see article by General Arnold on 'Air Force in the Atomic Age,' in *One World or None*.

decreased so as to increase the force of the explosion, the area over which the increased force is obtained is correspondingly¹ reduced.

Support for these views was given by Rear-Admiral Parsons, Director of atomic defence for the U.S. Navy,² to the effect that there is 'no straightforward approach, based on scientific and engineering data available in early 1947, which would produce ranges with V₂ type vehicles beyond a few hundred miles.' Regarding 'inter-continental supersonic missiles' as still in the stage of 'unrealized blueprint ideas', Admiral Parsons deduced that 'delivery of atomic bombs at ranges of 1,000 miles or more would require that they be carried in subsonic or transonic vehicles against which there are several means of defence, including jet-propelled fighters armed with rockets and jet or rocket propelled anti-aircraft missiles fired from the ground'. He concluded that 'against an alert and well-equipped defence subsonic delivery would be costly and would require a large number of bombs in order to get home a decisive attack'. This last sentence would perhaps be more accurate if the word 'bombs' were replaced by 'aircraft'.

In spite of these arguments, one finds repeatedly statements which imply that successful long-range attack with pilotless vehicles against atomic installations are likely to be possible.

For instance we find the following remark by F. H. Osborne, Deputy U.S. Representative at the United Nations Atomic Energy Commission. 'The aeroplane or rocket carrying atomic explosive is a conclusive weapon. It extends the range of power of those possessing it to the farthest corner of this planet.'³

From this analysis we conclude that certainly for ranges over 1,000 miles and probably also for ranges over 400 miles, the only vehicle for the delivery of an atomic bomb with adequate accuracy within the next ten years will be the conventional piloted aircraft. We have, therefore, first to consider the possibility of delivering atomic bombs with ordinary aircraft within the next five years at extreme inter-continental ranges of the order of 2,000 miles.

There are already in existence aircraft such as B36's and B50's

¹ According to R. E. Lapp (B.A.S., Feb. 1948), the optimum height of explosion to give the maximum area of destruction on the ground is about 2,500 feet. Lapp points out that at Nagasaki, when the bomb was 'exploded high in the air, about ten square miles of city were hard hit, whereas Alamogordo (New Mexico) where the bomb was exploded at low altitude, only three square miles or less were damaged to the same degree'.

² Quoted by the *New York Times*, 19 March 1947.

³ B.A.S., July 1947.

On the other hand we read in the *Compton Report*: '... the era of push-button warfare, in which inter-continental rockets with atomic war-heads wipe out tens of millions overnight, has not yet arrived. It is extremely unfortunate that the mistaken idea has been planted in so many minds that that era is now present

which could just do such journeys and return, or could strike at still longer ranges if the crew were prepared not to return. It has often been argued from this fact that repeated military operations at such distances are possible. This is, however, far from certain, as it neglects (as did Douhet and his school) the possible parallel increase in defence measures. The view of the American Navy is clear on this point.

The large subsonic bombing aircraft, on the other hand, operating at extreme range, and without a heavy fighter escort, cannot be considered a sufficiently reliable means of delivering scarce and expensive atomic bombs against a strong and well-alerted enemy. . . . The present technological trend is decidedly in favour of the defence as against the offence in ordinary strategic bombing. Means of detection and interception of subsonic bombing aircraft are making great strides. Guided, or homing missiles of the rocket type, fitted with proximity fuses, promise to give new potentialities to anti-aircraft fire. . . . Jet propulsion, permitting speeds far above those available to propeller-driven aircraft, is much more suited to short range fighter planes than to large, long range bombers, due to the tremendous and rapid fuel consumption involved in the jet principle. . . . At any rate, the present trend is the only one we can see in operation, and that trend decidedly favours—as against the recent past—the defence of large centres of population and industry.

Provided these statements are taken to refer to an atomic bomb offensive at really long ranges—for instance, at more than 2,000 miles, against a large and heavily defended country with very many essential targets widely spaced and many of them well inland, the conclusions are almost certainly true.

It is interesting in this connection to note the speed advantage of modern fighters compared with contemporary long-range bombers, as given in Jane's *All the World's Aircraft*, and other publications, from which the following figures are extracted:

Comparative Performance of Contemporary Fighters and Long-Range Bombers

Bomber	Bomb load lbs.	Max. Speed	Cruising Speed	Max. Alt. ft.	Radius of Action equals ½ range miles
		m.p.h.	m.p.h.		
B19 Super Fortress (U.S.)	10,000	342	240	33,000	1,630
B50 (U.S.)	20,000	400	300	35,000	1,750

CHAPTER X

THE DECISION TO USE THE BOMBS

THE origin of the decision to drop the bombs on two Japanese cities, and the timing of this event, both in relation to the ending of the Japanese war and to the future pattern of international relations, have already given rise to intense controversy and will surely be the subject of critical historical study in the future. The story has, however, great practical importance if one is to understand aright many aspects of American policy and opinion, and of the Russian reaction thereto.

It has already been pointed out in the last chapter that the scientists on the Franck Committee, in a memorandum to the President in June 1945, strongly deprecated the first use of the bomb against Japanese cities, on the grounds chiefly that the gain resulting from the expected shortening of the war, would be offset by the inevitable worsening of international relations. Doubts have often been expressed as to the justification for using the bombs in the way they were used, and many American scientists undoubtedly felt morally distressed at finding the results of their brilliant scientific work used in a way which seemed to many of them to lack adequate moral or military justification. Before the bomb was used, most scientists probably felt that the only justification for its use against Japan would be one of overriding military necessity, and there seems definite evidence that, earlier in the summer of 1945, the American authorities did not anticipate such a situation arising. For instance, the Washington correspondent of the London *Times* wrote in the issue of 8 August 1945 as follows:

The decision to use the new weapon was apparently taken quite recently and amounted to a reversal of previous policy. A correspondent in the *Baltimore Sun*, writing from an authority which seems unimpeachable, says that, until early in June, the President and military leaders were in agreement that this weapon should not be used, but a reversal of this High Command policy was made within the last sixty and, possibly the last thirty, days. There is, he says, much speculation about what caused this change of policy, but in the view of some highly placed persons those responsible came to the conclusion that they were justified in using

any and all means to bring the war in the Pacific to a close within the shortest possible time.

It will be one of the objects of this analysis to elucidate the origin of this presumed change of policy. President Truman stated in a speech on 9 August 1945, three days after the first bomb was dropped: 'We have used it in order to shorten the agony of war, in order to save the lives of thousands and thousands of young Americans.' Then, on October 3rd, in a message to Congress, he said: 'Almost two months have passed since the atomic bomb was used against Japan. That bomb did not win the war, but it certainly shortened the war. We know it saved the lives of untold thousands of American and Allied soldiers who otherwise would have been killed in battle.'

In an article published in the *Atlantic Monthly*, in December 1946, under the title 'If the Bomb had not been dropped', Dr. K. T. Compton gave his reasons for believing the decision to have been right. Dr. Compton writes: 'I had, perhaps, an unusual opportunity to know the pertinent facts.' At General MacArthur's H.Q., he learnt of the invasion plans and of 'the sincere conviction of the best-informed officers that a desperate and costly struggle was still ahead. . . . Finally, I spent the first month after VJ day in Japan, where I could ascertain at first hand both the physical and psychological state of the country. . . . From this background I believe with complete conviction, that the use of the atomic bomb saved hundreds of thousands—perhaps several million—of lives, both American and Japanese; that without its use the war would have continued for many months.' Dr. Compton quotes General MacArthur's staff as expecting 50,000 American casualties in the landing operations planned for November 1st, and a far more costly struggle later before the homeland was subdued. Dr. Compton's final views are as follows: 'If the bomb had not been used, evidence like I have cited points to the practical certainty that there would have been many more months of deaths and destruction on an enormous scale.'

On December 16th, President Truman wrote to Dr. Compton as follows:

DEAR DR. COMPTON,

Your statement in the *Atlantic Monthly* is a fair analysis of the situation except that the final decision had to be made by the President, and was made after a complete survey of the whole situation had been made. The conclusions reached were substantially those set out in your article. The Japanese were given fair warning, and were offered the terms which they finally ac-

cepted, well in advance of the dropping of the bomb. I imagine the bomb caused them to accept the terms.

Sincerely yours,

HARRY S. TRUMAN.

The next contribution of importance was an article in *Harper's Magazine*, in February 1947, by Mr. Stimson, who in 1945 was Secretary of State for War. This article is worthy of very close study. Mr. Stimson states that the President relied for advice on the 'Interim Committee' under his Chairmanship and having, as scientific members, Vannevar Bush, K. T. Compton and J. B. Conant. This Committee was assisted in its work by a Scientific Panel whose members were A. H. Compton, Fermi, Lawrence and Oppenheimer. Mr. Stimson's article reads:

On 1 June, after discussions with the Scientific Panel, the Interim Committee unanimously adopted the following recommendations.

- (1) The bomb should be used against Japan as soon as possible.
- (2) It should be used on a dual target—that is, a military installation or war plant surrounded by or adjacent to houses and other buildings most susceptible to damage, and
- (3) It should be used without prior warning of the nature of the weapon. One member later changed his view and dissented from the recommendation (3).

In reaching these conclusions the Interim Committee carefully considered such alternatives as a detailed warning or a demonstration in some uninhabited area. Both these suggestions were discarded as impracticable. They were not regarded as likely to be effective in compelling a surrender of Japan, and both of them involved serious risks. Even the New Mexico test would not give final proof that any given bomb was certain to explode when dropped from an aeroplane. Quite apart from the generally unfamiliar nature of atomic explosives, there was the whole problem of exploding a bomb at a predetermined height in the air by a complicated mechanism which could not be tested in the static test of New Mexico.¹

Nothing would have been more damaging to our effort to obtain surrender than a warning of a demonstration followed by a dud—and this was a real possibility. Furthermore, we had no bombs to waste. *It was vital that a sufficient effect be quickly obtained with the few we had* (Author's italics).

Later on in the article Mr. Stimson writes: 'The two atomic bombs

¹ A trial explosion at a predetermined height could of course equally well have been made over open country.

which we had dropped were the only ones we had ready, and our rate of production at that time was very small.'

Why this necessity for speed? What was it in the war plans of the Allies which necessitated rapid action? Mr. Stimson's article makes it clear that there was nothing in the American-British military plan of campaign against Japan which demanded speed in dropping the bombs in early August 1945.

Mr. Stimson describes the American war plans as follows:

The strategic plans of our armed forces for the defeat of Japan, as they stood in July, had been prepared without reliance on the atomic bomb, which had not yet been tested in New Mexico. We were planning an intensified sea and air blockade and greatly intensified air-bombing, through the summer and early fall, to be followed on 1 November by the invasion of the southern island of Kyushu. This would be followed in turn by the invasion of the main island of Honshu in the spring of 1946. We estimated that if we should be forced to carry the plan to its conclusion, the major fighting would not end until the latter part of 1946 at the earliest. I was informed that such operations might be expected to cost over a million casualties to American forces alone.

Since the next major United States move was not to be until 1 November, clearly there was nothing in the Allied plan of campaign to make urgent the dropping of the first bomb on 6 August rather than at any time in the next two months. Mr. Stimson himself makes clear that, had the bombs not been dropped, the intervening period of eleven weeks between August 6 and the invasion planned for 1 November would have been used to make further fire raids with B29's on Japan. Under conditions of Japanese air defence at that time, these raids would certainly have led to very small losses of American air personnel.

Mr. Stimson's hurry becomes still more peculiar since the Japanese had already initiated peace negotiations. In his own words: 'Japan, in July 1945, had been seriously weakened by our increasingly violent attacks. It was known to us that she had gone so far as to make tentative proposals to the Soviet Government, hoping to use the Russians as mediators in a negotiated peace. These vague proposals contemplated the retention by Japan of important conquered areas and were not therefore considered seriously. There was as yet no indication of any weakening of the Japanese determination to fight rather than accept unconditional surrender.'

On 20 July, the Big Three Conference at Potsdam was in session, and an ultimatum was sent to the Japanese Government on 26 July. This was rejected by the Premier of Japan on 28 July 'as unworthy

of public notice'. Unfortunately, Mr. Stimson does not give either the exact date or details of the Japanese approach for mediation through Russia or the content of their proposals. So the exact relation between this *secret* approach for mediation and the *public* refusal of the Potsdam terms is not clear. At any rate, the reason for the immediate necessity of dropping the bomb seems no clearer.

The solution of this puzzle of the overwhelming reasons for urgency in the dropping of the bomb is not, however, far to seek. It is, in fact, to be found in the omissions from both Dr. Compton's and Mr. Stimson's articles. As already shown, both give a detailed account of the future plans for the American assault on Japan planned for the autumn of 1945, and spring 1946. But neither makes any reference in detail to the other part of the Allied plan for defeating Japan, that is, the long-planned Russian campaign in Manchuria. We can, however, fill in this information from other sources; for instance, from Mr. Elliott Roosevelt's book, *As He Saw It*, published in September 1946.

In the chapter on the Yalta Conference (February 1945) Mr. Elliott Roosevelt writes: 'But before the Conference broke up, Stalin had once more given the assurance he had first volunteered in Teheran in 1943: that, within six months of VE day, the Soviet would have declared war on Japan; then, pausing in thought, he had revised that estimate from six months to three months.'

The European war ended on 8 May, so the Soviet offensive was due to start on 8 August. This fact is not mentioned either by Mr. Stimson or Dr. Compton in the articles from which we have quoted. The first atomic bomb was dropped on 6 August and the second on 9 August. The Japanese accepted the Potsdam terms on 14 August.

The U.S.S.R. declared war on Japan on 8 August, and their offensive started early on 9 August. On 24 August, the Soviet High Command announced that the whole of Manchuria, Southern Sakhalin, etc., had been captured and that the Japanese Manchurian army had surrendered. No doubt the capitulation of the home government on 14 August reduced the fighting spirit of the Japanese forces. If it had not taken place, the Soviet campaign might well have been more expensive; but it would have been equally decisive. If the saving of American lives had been the real objective, surely the bombs would have been held back until (a) it was certain that the Japanese peace proposals made through Russia were not acceptable, and (b) the Russian offensive, which had for months been part of the Allied strategic plan, and which Americans had previously demanded, had run its course.

In a broadcast to the American people on 9 August, President Truman described the secret military arrangements between the

Allies made at the Potsdam Conference. 'One of those secrets was revealed yesterday when the Soviet Union declared war on Japan. The Soviet Union, before she had been informed of our new weapon, agreed to enter the war in the Pacific. We gladly welcome into this struggle against the last of the Axis aggressors our gallant and victorious ally against the Nazis.'

Further details of the events which led up to the capitulation of Japan are given in the 'Report on the Pacific War prepared by the United States Strategic Bombing Survey'.

In the section significantly entitled 'Japan's struggle to end the War', we read:

By mid-1944, those Japanese in possession of basic information saw with reasonable clarity the economic disaster which was inevitably descending on Japan. Furthermore, they were aware of the disastrous impact of long-range bombing on Germany; and with the loss of the Marianas, could foresee a similar attack on Japan's industries and cities. Their influence, however, was not sufficient to overcome the influence of the Army which was confident of its ability to resist invasion.

The Report then outlines the Allied plan for the final defeat of Japan by staging a heavy air attack on Japan throughout the summer, to be followed by a large-scale landing on Kyushu in November 1945. The Report, however, states that 'Certain of the United States commanders and the representatives of the Survey who were called back from their investigations in Germany in early June 1945, for consultation, stated their belief that by the co-ordinated impact of blockade and direct air attack, Japan could be forced to surrender without invasion.' The Report continues:

Early in May 1945, the Supreme War Direction Council (*of Japan*) began active discussion of ways and means to end the war, and talks were initiated with Soviet Russia seeking her intercession as mediator. The talks by the Japanese Ambassador in Moscow and with the Soviet Ambassador in Tokyo did not make progress. On 20 June, the Emperor on his own initiative called the six members of the Supreme War Direction Council to a conference and said it was necessary to have a plan to close the war at once, as well as a plan to defend the home islands. The timing of the Potsdam Conference interfered with a plan to send Prince Konoye to Moscow as a special emissary with instructions from the Cabinet to negotiate for peace on terms less than unconditional surrender, but with private instructions from the Emperor to secure peace at any price. . . .

Although the Supreme War Direction Council, in its deliberations on the Potsdam Conference, was agreed on the advisability of ending the war, three of its members, the Prime Minister, the Foreign Minister and the Navy Minister, were prepared to accept unconditional surrender, while the other three, the Army Minister and the Chiefs of Staff of both Services, favoured continued resistance unless certain mitigating conditions were obtained. . . .

On 6 August, the atomic bomb was dropped on Hiroshima and on 9 August Russia entered the war. In the succeeding meetings of the Supreme War Direction Council, the difference of opinion previously existing as to the Potsdam terms persisted as before. By using the urgency brought about by the fear of further bombing attacks, the Prime Minister found it possible to bring the Emperor directly into the discussion of the Potsdam terms. Hirohito, acting as the arbiter, resolved the conflict in favour of unconditional surrender. . . .

It seems clear that even without the atomic bomb attacks, air supremacy over Japan could have exerted sufficient pressure to bring unconditional surrender and obviate the need for invasion. . . . Based on a detailed investigation of all the facts, and supported by the testimony of the surviving Japanese leaders involved, it is the Survey's opinion that certainly prior to the 31 December 1945 Japan would have surrendered even if the atomic bombs had not been dropped, even if Russia had not entered the war, and even if no invasion had been planned or contemplated.

General H. H. Arnold expressed the view¹ that 'without attempting to deprecate the appalling and far-reaching results of the atomic bomb, we have good reason to believe that its use primarily provided a way out for the Japanese Government. The fact is that the Japanese could not have held out long because they had lost control of the air. They could offer effective opposition neither to air bombardment nor to our mining by air and so could not prevent the destruction of their cities and industries and the blockade of their shipping.'

This account of the situation² is, of course, based on information, much of which was available only after the surrender of Japan. Thus some of it, for instance, the detailed instructions of the Emperor to Prince Konoye, could not have been known to the Allied Command at the time the decision to drop the first bombs was made.

¹ *One World or None*, p. 28.

² Paul Nitze, Vice-Chairman of the U.S.S.B.S., repeated the view in the Senate Committee Hearings (S. Res. 179, p. 530). 'It is our opinion that Japan would have surrendered prior to 1 November in any case; the atomic bomb merely accelerated the date at which Japan surrendered.'

It is also conceivable that in July 1945 the Allied High Command may have genuinely misjudged the real situation in Japan and have greatly overestimated the Japanese will to resist.¹ But all this information was naturally available to Mr. Stimson when he wrote his articles justifying the dropping of the bombs.

As far as our analysis has taken us we have found no compelling military reason for the clearly very hurried decision to drop the first atomic bomb on 6 August. But a most compelling diplomatic reason, relating to the balance of power in the post-war world, is clearly discernible.

Let us consider the situation as it must have appeared in Washington at the end of July 1945. After a brilliant, but bitterly-fought campaign, American forces were in occupation of a large number of Japanese islands. They had destroyed the Japanese Navy and Merchant Marine and largely destroyed their Air Force and many divisions of their Army: but they had still not come to grips with a large part of the Japanese land forces. Supposing the bombs had not been dropped, the planned Soviet offensive in Manchuria, so long demanded and, when it took place, so gladly welcomed (officially), would have achieved its objective according to plan. This must have been clearly foreseen by the Allied High Command, who knew well the great superiority of the Soviet forces in armour, artillery and aircraft, and who could draw on the experience of the European war to gauge the probable success of such a well-prepared offensive. If the bombs had not been dropped, America would have seen the Soviet armies engaging a major part of Japanese land forces in battle, overrunning Manchuria and taking half a million prisoners. And all this would have occurred while American land forces would have been no nearer Japan than Iwojima and Okinawa. One can sympathize with the chagrin with which such outcome would have been regarded. Most poignantly, informed military opinion could in no way blame Russia for these expected events. Russia's policy of not entering the Japanese war till Germany was defeated was not only military common sense but part of the agreed Allied plan.

In this dilemma, the successful explosion of the first atomic bomb in New Mexico, on 16 July, must have come as a welcome aid. One can imagine the hurry with which the two bombs—the only two existing—were whisked across the Pacific to be dropped on Hiroshima and Nagasaki just in time, but only just, to ensure that the Japanese Government surrendered to American forces alone. The

¹ It is not in dispute that had the invasion of Kyushu taken place as planned in November, and had the Japanese military forces fought as determinedly as they had previously, the American casualties would have been very heavy. All the available evidence suggests, however, that the Tokyo Government would have capitulated first.

long-demanded Soviet offensive took its planned victorious course, almost unheralded in the world sensation caused by the dropping of the bombs.

Referring to these events, a British military historian wrote:¹

Two days later, Russia declared war on Japan; but so great an impression was made on the world by the first atomic bomb, that very few people took any notice of this important step. . . . The atomic bombs undoubtedly contributed to bring about the Japanese decision. So, also, to a lesser extent, did the swift and skilful over-running of Manchuria by the Russians. But it is impossible to hold that either, or both together, brought it about. The atomic bombs provided an excuse, a face-saving event that was seized upon to justify a surrender which was as abject as that of Germany and much less explicable.

The last four words of this sentence cannot have been intended as a serious judgment.

Of particular interest is the following quotation from the *New York Times* of 15 August 1945. Under the headline, 'Chennault holds Soviet Forced End: Russia's Entry Decided War with Japan despite Atomic Bomb, an Air General says', appears a report of an interview by the newspaper's Rome correspondent, containing the following passages:

Russia's entry into the Japanese war was the decisive factor in speeding its end and would have been so, even if no atomic bombs had been dropped, is the opinion of Major-General Claire Chennault, who arrived *en route* home via Germany. The founder of the American Volunteer Group (Flying Tigers) and former Air Force Commander in China said that the Soviet armies had been alert for the invasion of Manchuria as far back as VE day. He added that their swift stroke completed the circle around Japan that brought the nation to its knees.

The special significance of this statement is that not only was it made by an expert on the Far Eastern war, on the basis of the then available evidence, but that it was made while the General was still in Europe and so was not so likely to appreciate the significance of Mr. Truman's statement on 9 August that 'we have used it in order to shorten the agony of war, in order to save the lives of thousands and thousands of young Americans'.

That this is no fanciful account of these events is seen in a clear picture of the relation between the dropping of the bomb and the planned Soviet Offensive given in an article by two American

¹ Strategic, *The Victory Campaign*, p. 242. London, 1947.

writers, Norman Cousins and Thomas K. Finletter, originally published in the *Saturday Review of Literature*, 15 June 1946. They refer in detail to the Report of the Committee under James Franck from which we have already quoted. 'This report, not made public by the War Department at the time, is one of the most important American documents of recent years—even though it is virtually unknown to the American people.' After analysing and approving in general the arguments in the report against an initial use of bombs against Japan, and in favour of a demonstration to be witnessed by the United Nations, they write as follows:

Why then did we drop it? Or, assuming that the use of the bomb was justified, why did we not demonstrate its power in a test under the auspices of the United Nations, on the basis of which an ultimatum would be issued to Japan—transferring the burden of responsibility to the Japanese themselves? . . .

Whatever the answer, one thing seems likely: there was not enough time between 16 July, when we knew at New Mexico that the bomb would work, and 8 August, the Russian deadline date, for us to have set up the very complicated machinery of a test atomic bombing involving time-consuming problems of area preparations, etc. . . .

No; any test would have been impossible if the purpose was to knock Japan out before Russia came in—or at least before Russia could make anything other than a token of participation prior to a Japanese collapse.

It may be argued that this decision was justified; that it was a legitimate exercise of power politics in a rough-and-tumble world; that we avoided a struggle for authority in Japan similar to that we have experienced in Germany and Italy; that, unless we came out of the war with a decisive balance of power over Russia, we would be in no position to checkmate Russian expansion.

This interpretation by Cousins and Finletter substantially confirms our own analysis.¹ The hurried dropping of the bombs on Hiroshima and Nagasaki was a brilliant success, in that all the political objectives were fully achieved. American control of Japan is complete, and there is no struggle for authority there with Russia.

Two other theories of the timing of the dropping of the bomb are

¹ Particular interest attaches to these articles as one of the authors was later chosen by the President to be Chairman of 'The Air Policy Committee', whose report, under the title of *Survival in the Air Age* is reviewed in an Appendix. One can reasonably assume, therefore, that the authors of the article from which we have quoted were likely to be well-informed persons and with a reliable judgment of affairs. Quite recently Mr. Finletter has been appointed head of the Marshall Plan Mission in London (*The Times*, 26 May 1948).

worth a brief notice. The first is that it was purely coincidental that the first bomb was dropped two days before the Soviet offensive was due to start. This view explains Mr. Stimson's statement, 'It was vital that a sufficient effort be quickly obtained with the few we had', as referring to the universal and praiseworthy desire to finish the war as soon as possible. The difficulty about this view is that it makes the timing of the dropping a supreme diplomatic blunder. For it must have been perfectly clear that the timing of the dropping of the bombs, two days before the start of the Soviet offensive, would be assumed by the Soviet Government to have the significance which we have assumed that it, in fact, did have. If it was not intended to have this significance, then the timing was an error of tact, before which all the subsequent 'tactlessness' of Soviet diplomacy in relation to the control of atomic energy pales into insignificance. That the timing was not an unintentional blunder is made clear by the fact that no subsequent steps were taken to mitigate its effects.

The second view relates, not to the timing, but to the choice of an unwarned and densely populated city as target. This view admits that there was no convincing military reason for the use of the bombs, but holds that it was a political necessity to justify to Congress and to the American people the expenditure of the huge sum of 2,000 million dollars. It is scarcely credible that such an explanation should be seriously put forward by Americans, but so it seems to have been, and rather widely. Those who espouse this theory do not seem to have realized its implications. If the United States Government had been influenced in the summer of 1945 by this view, then perhaps at some future date, when another 2,000 million dollars had been spent, it might feel impelled to stage another Roman holiday with some other country's citizens, rather than 120,000 victims of Hiroshima and Nagasaki, as the chosen victims. The wit of man could hardly devise a theory of the dropping of the bomb, both more insulting to the American people and providing greater justification for an energetically pursued Soviet defence policy.

Let us sum up the three possible explanations of the decision to drop the bombs and of its timing. The first, that it was a clever and highly successful move in the field of power politics, is almost certainly correct; the second, that the timing was coincidental, convicts the American Government of a hardly credible tactlessness, and the third, the Roman holiday theory, convicts them of an equally incredible irresponsibility. The prevalence in some circles for the last two theories seems to originate in a curious preference to be considered irresponsible, tactless, even brutal, but at all costs not clever.

There is one further aspect of the dropping of the bomb which

must be mentioned. There were undoubtedly, among the nuclear physicists working on the project, many who regarded the dropping of the bombs as a victory for the progressively minded among the military and political authorities. What they feared was that the bombs would *not* be dropped in the war against Japan, but that the attempt would be made to keep their existence secret and that a stock-pile would be built up for an eventual war with Russia. To those who feared intensely this latter possible outcome, the dropping of the bombs and the publicity that resulted appeared, not un-plausibly, as far the lesser evil. Probably those whose thoughts were on these lines, did not reckon that the bombs would be dropped on crowded cities.

The motives behind the choice of targets remains obscure. President Truman stated on 9 August 1945: 'The world will note that the first atomic bomb was dropped on Hiroshima, a military base. That was because we wished in the first instance to avoid, in so far as possible, the killing of civilians.' On the other hand, in the official *Bombing Survey Report* we read: 'Hiroshima and Nagasaki were chosen as targets because of their concentration of activities and population.' There seem here signs of a lack of departmental co-ordination.

So, in truth, we conclude that the dropping of the atomic bombs was not so much the last military act of the second world war, as the first act of the cold diplomatic war with Russia now in progress. The fact, however, that the realistic objectives in the field of *Macht-Politik*, so brilliantly achieved by the timing of the bomb, did not square with the advertised objective of saving 'untold numbers' of American lives, produced an intense inner psychological conflict in the minds of many English and American people who knew, or suspected, some of the real facts. This conflict was particularly intense in the minds of the atomic scientists themselves, who rightly felt a deep responsibility at seeing their brilliant scientific work used in this way. The realization that their work had been used to achieve a diplomatic victory in relation to the power politics of the post-war world, rather than to save American lives, was clearly too disturbing to many of them to be consciously admitted. To allay their own doubts, many came to believe that the dropping of the bombs had in fact saved a million lives. It thus came about that those people who possessed the strongest emotional drive to save the world from the results of future atomic bombs, had in general a very distorted view of the actual circumstances of their first use.

It can never be repeated often enough that the first maxim of the scientific study of current events is that one should not attempt to predict the future until one has attempted to understand the past.

All attempts to control atomic energy involve predictions about the course of future events and, in particular, prediction of the probable part that atomic bombs will play in future wars. It is certainly necessary to make such estimates in order to approach the problem of their control in a rational manner. Inaccurate views as to the historical facts of their first use are a poor basis on which to plan for the future.

Perhaps the most important consequence of this situation, and of the inner personal conflicts to which it gave rise, is the firm belief amongst many Americans that it is certain that atomic bombs will be used against civilian populations at the outset of future wars as a matter of course and in all circumstances. Dr. J. R. Oppenheimer, with his characteristic clarity of expression, explains the origin of this view. 'Every American knows that if there is another major war, atomic weapons will be used. We know this because in the last war, the two nations which we like to think are the most enlightened and humane in the world—Great Britain and the United States—used atomic weapons against an enemy which was essentially defeated.' In the place of a rational attempt to understand in detail the part that atomic bombs are likely to play in future world affairs, and of the circumstances in which they would be likely to be used again, an atmosphere of imminent world destruction arose in which clear thinking was at a discount and emotion triumphant. The world became regaled with authoritative statements which departed wildly from the realm of probability. Of particular importance is the strand of thought represented by the well-known statement of Mr. Stimson, who wrote:¹ 'The future may see a time when such a weapon may be constructed in secret and used suddenly and effectively with devastating power by a wilful nation or group against an unsuspecting nation or group of much greater size and material power. With its aid even a very powerful and unsuspecting nation might be conquered within a very few days by a very much smaller one . . .'
(Author's italics).

This view has two most important consequences. Firstly, it implies that an unsuspecting United States itself might be defeated in a few days by a very much smaller nation. The obvious result has been to stimulate a hysterical search for 100 per cent security from such attack. Since there can be no such complete security for America, except through world hegemony imposed by America, Mr. Stimson's view, which is very widely accepted, justified a drive towards world hegemony by America in one form or another.

Secondly, the inescapable conclusion from the assumption that a small nation with atomic bombs could defeat a great nation without

✓ ¹ B.A.S., 3 Feb. 1947.

them in a few days, was that a great nation with bombs (America) could defeat another great nation (Russia) in a few hours, and consequently very cheaply. The justification for a cheap preventative war, of the 'press-button' variety, became complete. The logic of the Irishman in the story was applied to the bomb. On seeing a stove advertised to save half one's fuel, he bought two to save it all! If two bombs could save a million American lives in a war with Japan, then a hundred would save them all in a war with Russia.

In all this discussion the question of the military effect of atomic bombs and their effect on warfare is of paramount importance; a full discussion has already been attempted in earlier chapters. From the point of view of the present discussion, the significant point is obvious. Atomic bombs will be used in future wars when the potential user estimates that the net gain, at any rate for some years, over the whole military, political and economic field is likely to be markedly positive. As has already been shown, this condition was fulfilled in the views of the American, and presumably also the British, statesmen in August 1945. But, this commonsense view shows up in its provocative nonsense such a remark¹ as 'If Russia had atomic bombs, they would already have been dropped on the United States'.

In the atmosphere created by such statements, the drive for one hundred per cent security from atomic bombs becomes understandable, but none the less highly dangerous. For perfect security from any of the dangers besetting humanity is clearly not attainable. If one is a motor driver, complete security against the danger of being killed in a collision with another motor-car can only be attained by prohibiting anyone but oneself from driving a car—that is, by the abolition of road transport. It is to be noticed that there are strong tendencies in America to-day which strive for the illusionary goal of 100 per cent security from atomic bombs,² by attempting to prevent anyone else using atomic energy for any major purpose.

The story behind the decision to drop the two atomic bombs on Hiroshima and Nagasaki, as far as it is possible to unravel it from the available published material, has been told in this chapter not with the intention of impugning motives of individuals or of nations,

¹ Mr. Bullitt, ex-Ambassador at Moscow, quoted by the *New Republic* 7 April 1947. A still wilder expression of self-induced fear or deliberate provocation is Mr. Walter Winchell's remark, quoted by the *News Chronicle* on 20 October 1947. 'Russia is going to make war on America. The cholera epidemic in Egypt is suspected of being the first Soviet experiment in mass killings by germs.'

² Dr. Oppenheimer has recently written: 'In fact, it appears most doubtful if there are now any courses open to the United States which can give to our people the sort of security they have known in the past. The argument that such a course must exist seems to be specious; and in the last analysis most current proposals rest on this argument.'

but for a much more practical reason. This is to attempt to offset as far as possible some of the disastrous consequences resulting from the promulgation of the official story, that the bombs were dropped from vital military necessity and did, in fact, save a huge number of American lives. For this story is not believed by well-informed people who therefore have to seek some other explanation. Since they reject the hypothesis that they were dropped to win a brilliant diplomatic victory as being too morally repugnant to be entertained, the only remaining resort is to maintain that such things just happen, and that they are the 'essence of total war'. Believing therefore that America dropped atomic bombs on Japan for no compelling military or diplomatic reason, the belief comes easily that other countries will, when they can, drop atomic bombs on America with equal lack of reason, military or diplomatic. This is a belief that provides the breeding ground for hysteria.

In decisive contrast are the consequences of believing what the writer holds to be the truth, that is, that the bombs were dropped for very real and compelling reasons—but diplomatic rather than military ones. For though the circumstances did then exist in which a great diplomatic victory could be won by annihilating the population of two cities, these circumstances were of a very special character and are not very likely to recur. If they did recur, few nations would perhaps resist the temptation to employ these means to attain such an end. But if we are right in supposing that a repetition of such special circumstances is unlikely, then the world is less in danger of more Hiroshimas than is generally believed.

*But reasons were less compelling than
is believed: because PMSB did not believe
of Magic!*

*(Yes, war could have been ended by
dropping UCS earlier; but this would
have omitted demonstration of Bomb to
Soviet, for Europe!*

CHAPTER XI

THE BARUCH PLAN

WHEN the Atomic Energy Commission first met, the auspices for a successful outcome were not good. On the one hand stood Russia, fully conscious of the reasons behind the first use of the atomic bombs by America, and clearly also keenly aware of the immediate danger to her military security and the long-range danger to her economic development underlying the idealistic phraseology of the Lilienthal Plan. On the other hand, America was seeking an unattainable hundred per cent security from the weapon she was so proud to have developed and so ashamed to have used. The diplomatic initiative in the matter of atomic energy inevitably lay in American hands, as the only nation with the know-how, the plants and the bombs. The world waited anxiously for American leadership which would offer some hope of an agreed solution.

At the first meeting of the Commission, which took place in New York on 13 June 1946, Bernard Baruch put forward, on behalf of the American Government, proposals for international control of atomic energy. At the second meeting on 19 June, Andrej Gromyko presented the Soviet proposals. These rival proposals have been the subject of endless debate and the cause of intense mutual national recriminations during the two years that have elapsed since their first presentation. In spite of minor changes from time to time in the tactics of both major contestants, the essential clash of view-points revealed by these two documents persists in essentially the same form to-day and is clearly the cause of the present impasse. It would neither be profitable, nor possible within the compass of a small book, to attempt to follow in detail the course of the debate. It is, however, essential to study the two proposals, as they were originally put forward; to analyse the motives of their authors, and to attempt to predict the consequences to the world had either been accepted.

In essence, the American proposals amounted to the adoption of the recommendations of the Acheson-Lilienthal Report, with the important addition that decisions relating to atomic energy and to the imposition of sanctions against violation of any agreement reached between the Powers, should not be subject to the unanimity

APPENDIX I

THE ALLIED BOMBING OFFENSIVE IN EUROPE 1939-45

THE following statistics and quotations are taken from the reports of the *United States Strategic Bombing Survey*. (Overall Report, European War, U.S.S.B.S., 1; Effect of Bombing on Health & Medical Care in Germany, U.S.S.B.S., 2; Effect of Strategic Bombing on the German War Economy, U.S.S.B.S., 3.)

'The total weight of bombs dropped on all targets by the Anglo-American forces was 2,700,000 tons. The total loss of planes (bomber and escorting fighters) was 40,000, and the personnel lost in action was 180,000. The total services personnel engaged in the European Air War reached 1,300,000 in 1944 and 1945' (U.S.S.B.S., 1).

TABLE 1
Total Weight of Bombs on Countries

		per cent
Germany	1,350,000 tons	50.3
France	590,000 "	21.8
Italy & Sicily	370,000 "	13.7
Austria & Balkans	180,000 "	6.7
Total	2,690,000 "	

TABLE 2
Weight of Bombs on Germany alone in each year

	Weight of bombs	No. of killed	No. of killed per ton
1940	10,000 tons	350	0.03
1941	30,000 "	2,800	0.1
1942	40,000 "	4,300	0.1
1943	120,000 "	103,000	0.9
1944	600,000 "	201,000	0.3
1945 (4 months)	500,000 "	110,000	0.2
	1,300,000 "	appr. 500,000 ¹	0.38

¹ U.S.S.B.S., 2. A lower figure, 300,000, is given in U.S.S.B.S., 1.

APPENDICES

TABLE 3

Division of the Total Weight of Bombs dropped for all Countries between types of targets (U.S.S.B.S., 1).

Target	Tons	per cent
Land Transportation	800,000	32.1
Industrial Areas	640,000	23.7
Military	300,000	11.1
Oil and Chemicals	250,000	9.3
Airfields	190,000	6.9
Aircraft Factories	48,000	1.8
Others	410,000	15.1

TABLE 4

Index of Total German War Production from figures given by Kaldor¹

Total War Production	
1940	100
1941	101
1942	146
1943	229
1944	285

TABLE 5

Yearly Production of Aircraft and Tanks in Germany;² and the United Kingdom

Year	Aircraft		Tanks	
	Germany	U.K.	Germany	U.K.
1940	10,200	15,000	1,500	1,400
1941	11,000	20,100	3,800	4,800
1942	14,200	23,600	6,300	8,600
1943	25,000	26,200	12,100	7,500
1944	39,600	26,500	19,000	4,600
Total	100,000	111,400	42,800	26,900

Productions of synthetic rubber and oil reached their peak in the Spring of 1944, after which they suffered a rapid fall due to very successful attacks on the plants.

¹ Review of Economic Studies, Vol. 13, p. 33, 1945-6.

² U.S.S.B.S., 3.

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TABLE 6

Fall of Oil Production in 1944

		<i>per cent</i>
Jan.	—	100
March	—	100
May	—	80
July	—	20
Sept.	—	5
Nov.	—	20

Very similar trends are shown by the German rail transport,¹ which remained roughly constant throughout the war till the Spring of 1944, after which it fell precipitately to nearly a complete stoppage in early 1945. It was the breakdown of transport due to the bombing which was mainly responsible for the final collapse of overall production in the autumn of 1944, not the actual destruction of the factories or the cities.

The 'area bombing' of 61 German cities having a population of 100,000 or more, on which over half a million tons were dropped (80 per cent by British night bombers) was very effective in destroying them. It is estimated that 3,600,000 dwelling units (about 70 per cent of all residential units in these cities) were destroyed, some 500,000 civilians were killed, and 7,500,000 rendered homeless.² It is not clear from the published analyses what portion of the total number of civilian killed arose from the area bombing, and how much from the bombing of other targets. (See Table 3 for relative weight of attacks.)

On the other hand, the effect on production was relatively small; the estimated figures for the loss of production due to the mass attacks on cities are as follows:

TABLE 7

*Loss of Production due to Area Bombing of
German Cities (U.S.S.B.S., 1).*

	<i>Tonnage</i>	<i>Loss as per cent of annual Reich production</i>
1942	38,000	2.5
1943	135,000	9.0
1944	255,000	17.0
1945 (Jan to April)	97,000	6.5
Total	525,000	

¹ A detailed analysis of the effects of these attacks is given by Tedder, *Air Power in War* (1948), p. 110 et seq.

² U.S.S.B.S., 1, p. 72 and U.S.S.B.S., 4, p. 11.

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Lord Tedder (op. cit., p. 106) states that during 1943 the bombing offensive as a whole reduced German total production by 10 per cent and armament production by 5 per cent.

Figure 1, Chapter I, showed the actual production of armaments annually (curve 1), together with what it would have been in the absence of the *city bombing* (curve 2), using the estimated loss of production given above. Curve 3 showed the *total* weight of bombs on Germany in half-yearly intervals.

Figure 2 gives the German Armament production in three monthly intervals (Kaldor and U.S.S.B.S., 3).

An indirect effect of the campaign not fully shown in the quoted figures lay in the diversion of some 4,500,000 workers from other activities to debris clearance and reconstruction (1,000,000), replacement of civilian goods (1,000,000), and manning and production of anti-aircraft munitions (1,000,000).

APPENDIX II

WAR CASUALTIES OF THE POWERS 1939-45

Germany

No figures for the total German casualties up to the end of the war appear to be available, but figures from 1 September 1939 to 30 November 1944 are given in great detail in a document found in the house of General Reinicke, head of the German High Command Propaganda Department. Extracts from these documents were published in British and American newspapers of 30 July 1945.

TABLE I

German War Casualties up to 30 November 1944

<i>Campaign</i>	<i>Killed</i>	<i>Missing</i>	<i>Total</i>
West (till 6 June 1944)	66,000	3,000	69,000
West (6 June-Nov. 1944)	54,000	338,000	392,000
N. Africa	12,000	90,000	102,000
Italy	48,000	97,000	145,000
Balkans	24,000	12,000	36,000
Germany	64,000	1,000	65,000
Russia	1,419,000	907,000	2,326,000
Total	1,687,000	1,448,000	3,135,000

From these figures it can be estimated that up to D day, that is, up to 6 June 1944, about 85 per cent of all German casualties had been incurred on the Eastern Front. Up to 30 November 1944 this fraction was still about 75 per cent.

Total Casualties of the Powers

The following rough figures for the total casualties (killed, missing and wounded, both military and civilian) are taken from *The World Almanack 1948*, p. 551 et seq. The pre-war population figures are taken from *Whitaker's Almanack 1936*, p. 185 et seq.

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<i>Country</i>	<i>Casualties (millions)</i>	<i>(1935) Population (millions)</i>	<i>Casualties as Percentage of Population</i>
U.S.A.	1.04	137	0.8
U.K.	0.57	45	1.3
France	0.75	41	1.8
Germany	9.5	66	14.3
Japan	6.5	84	7.7
Poland	5.6	32	17.5
Czechoslovakia	0.5	14.7	3.4
Jugoslavia	1.7	14	12.2
U.S.S.R.	13.5	162	8.3

These rough figures can be supplemented by rather more detailed and somewhat different estimates from various sources, for the collection of which I am indebted to the Information Department of the Royal Institute of International Affairs, Chatham House, London.

*France*¹ 160,000 military deaths
160,000 civilians killed
300,000 deaths of prisoners, deportees and compulsory workers in Germany.

Total 620,000

*Poland*¹ 600,000 killed by direct war action
3,900,000 lives lost by execution and liquidation of the ghetto
1,400,000 lives lost in concentration camps and enforced work.

Total 5,900,000

*Czechoslovakia*² 245,000 mainly civilian, i.e. 1.25 per cent of pre-war population, compared with 3.5 per cent given in *World Almanack*.

*Jugoslavia*² 1,660,000 including 1,380,000 civilian, i.e. 10.5 per cent of pre-war population.

U.S.S.R. Mr. Molotov at the Paris Peace Conference stated that 7,000,000 Soviet soldiers fell in battle. In addition the Paris Institute for Research in the Soviet Economy estimate the civilian losses to be 10,000,000, of which one half were killed and one half dead from cold, starvation or deportation.

¹ Report of Temporary Sub-Committee on Economic Reconstruction of Devastated Areas. Economic and Social Council (Sept. 1946).

² International Committee for the Study of European Questions. Memorandum on the Results of the war (1939-45).